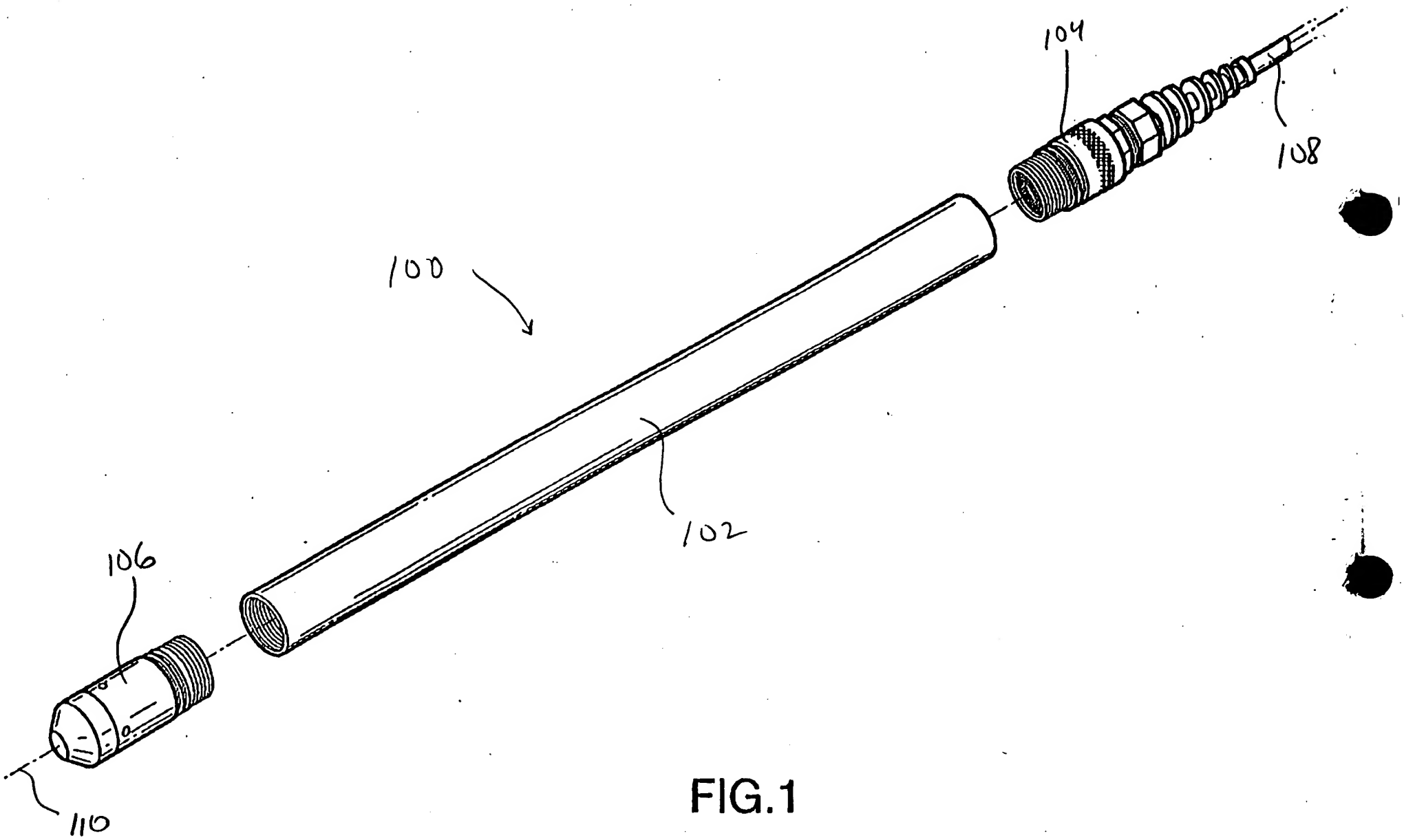


FIG.1

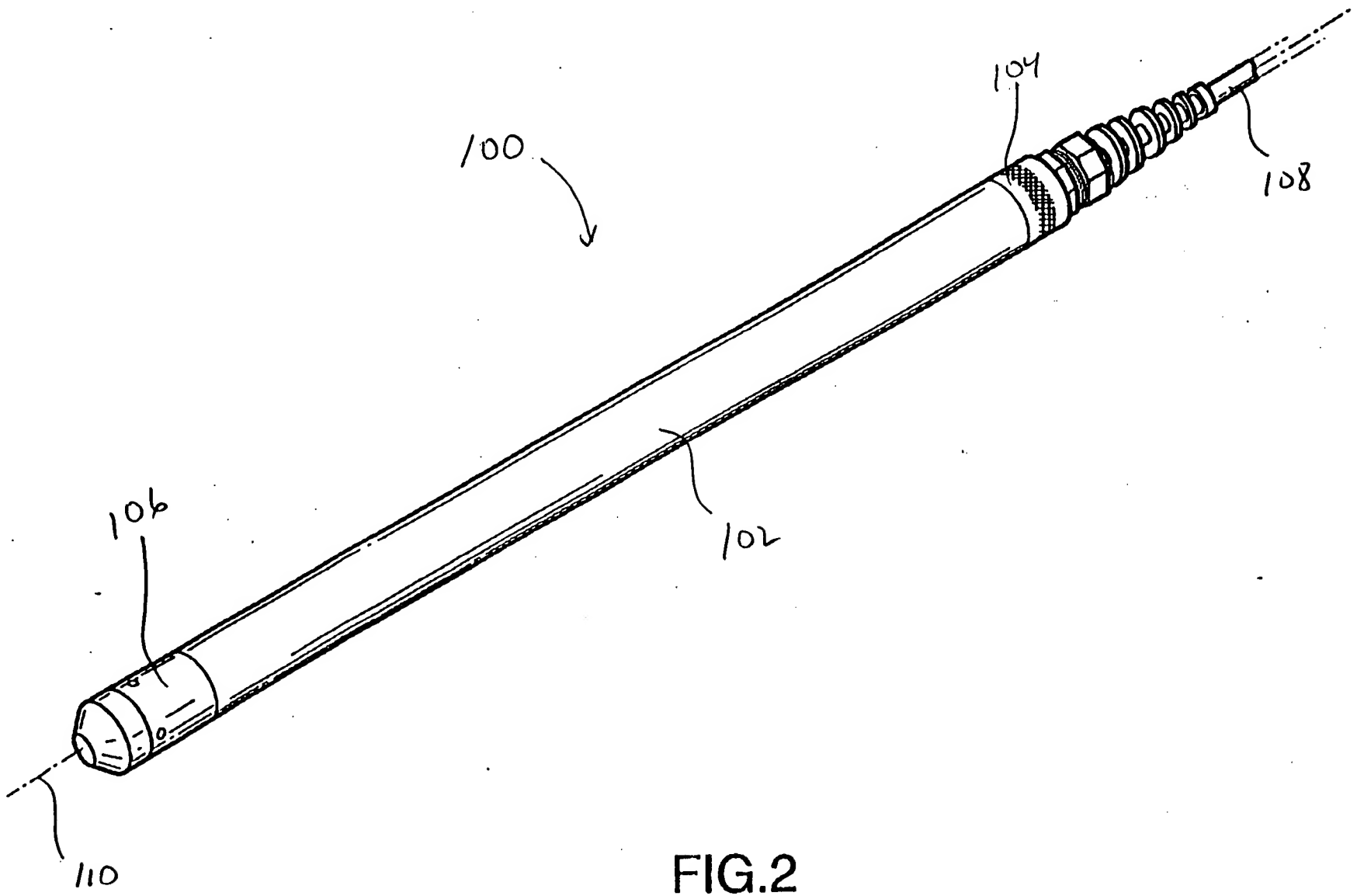


FIG.2

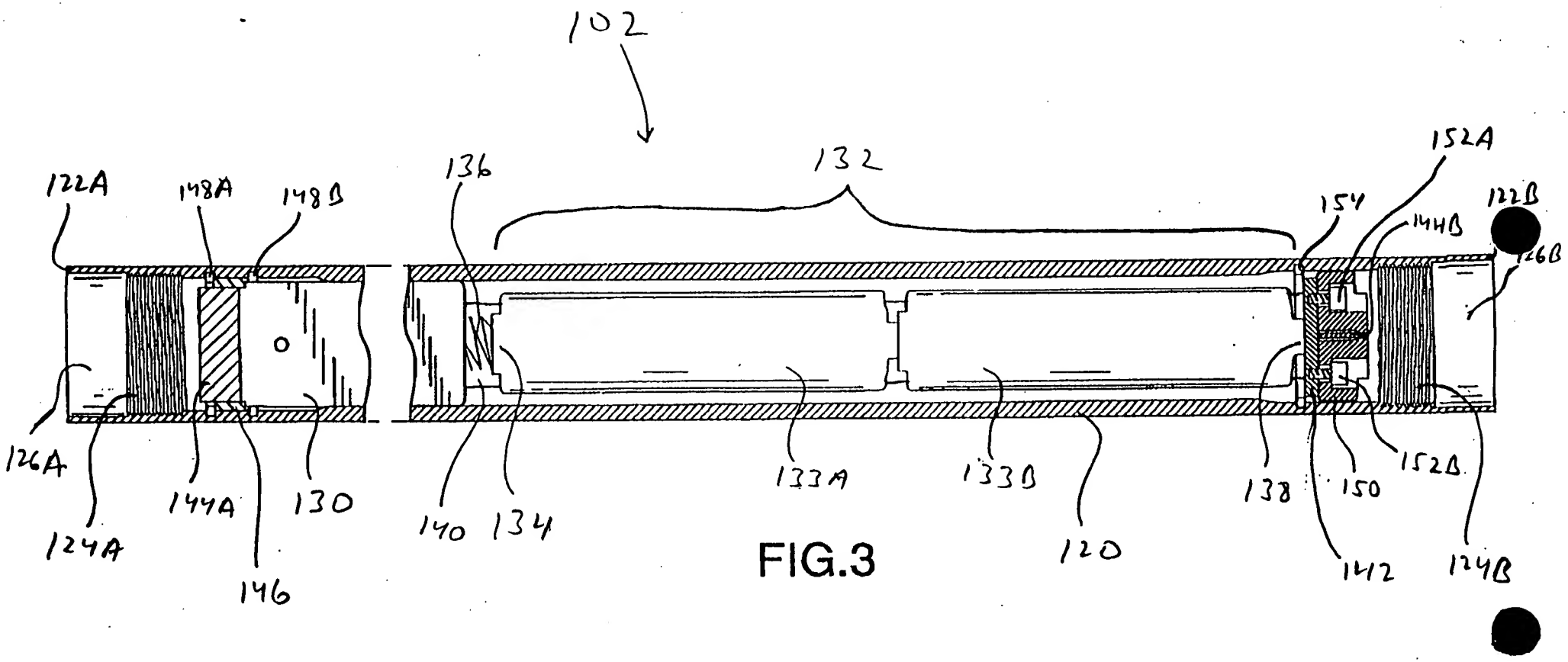


FIG.3

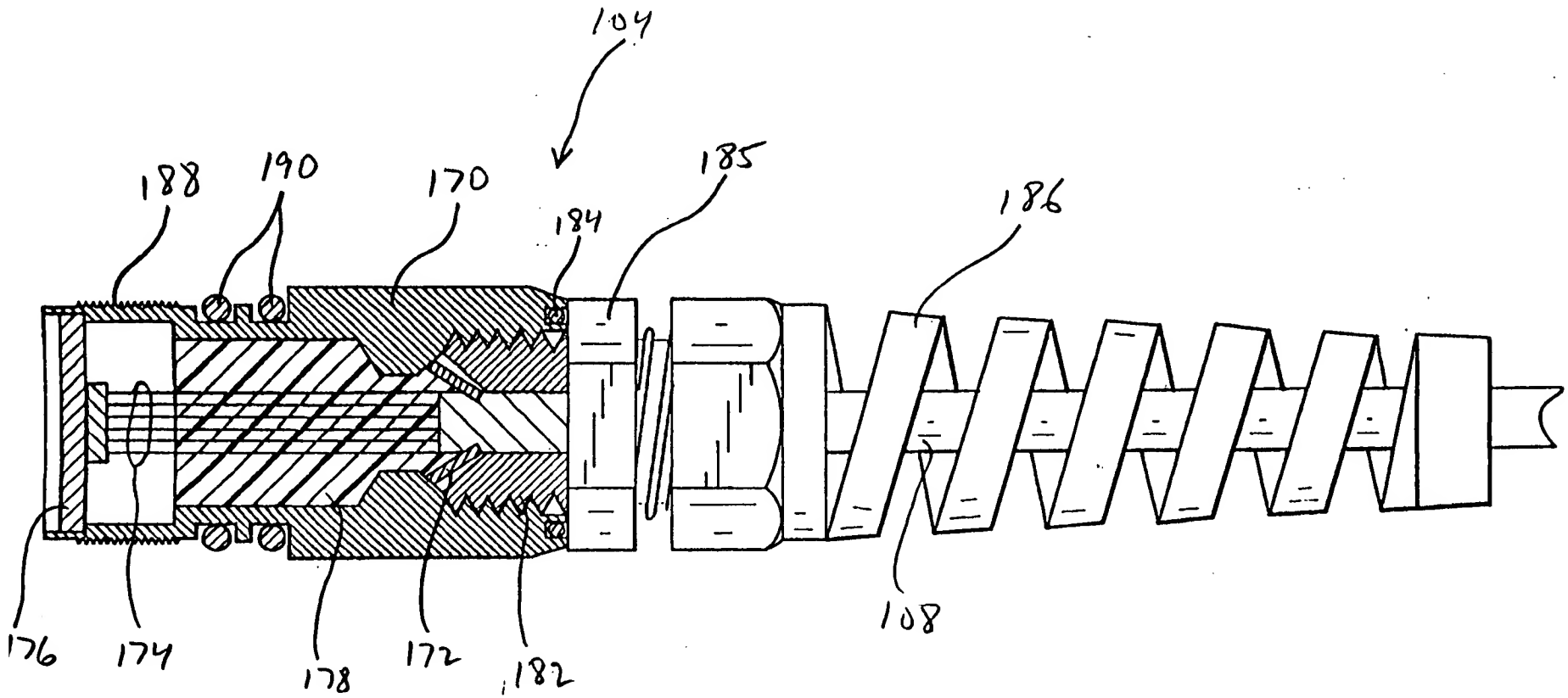


FIG.4

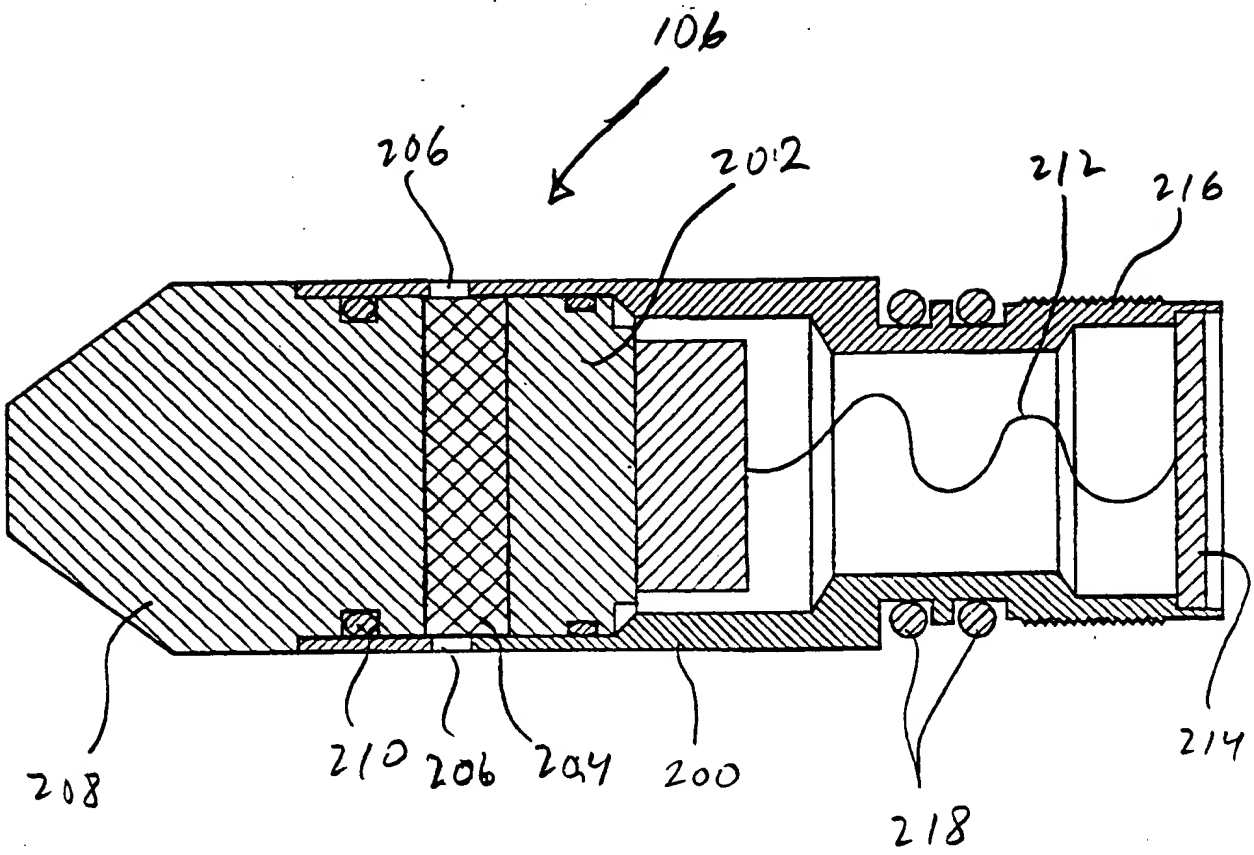


FIG.5

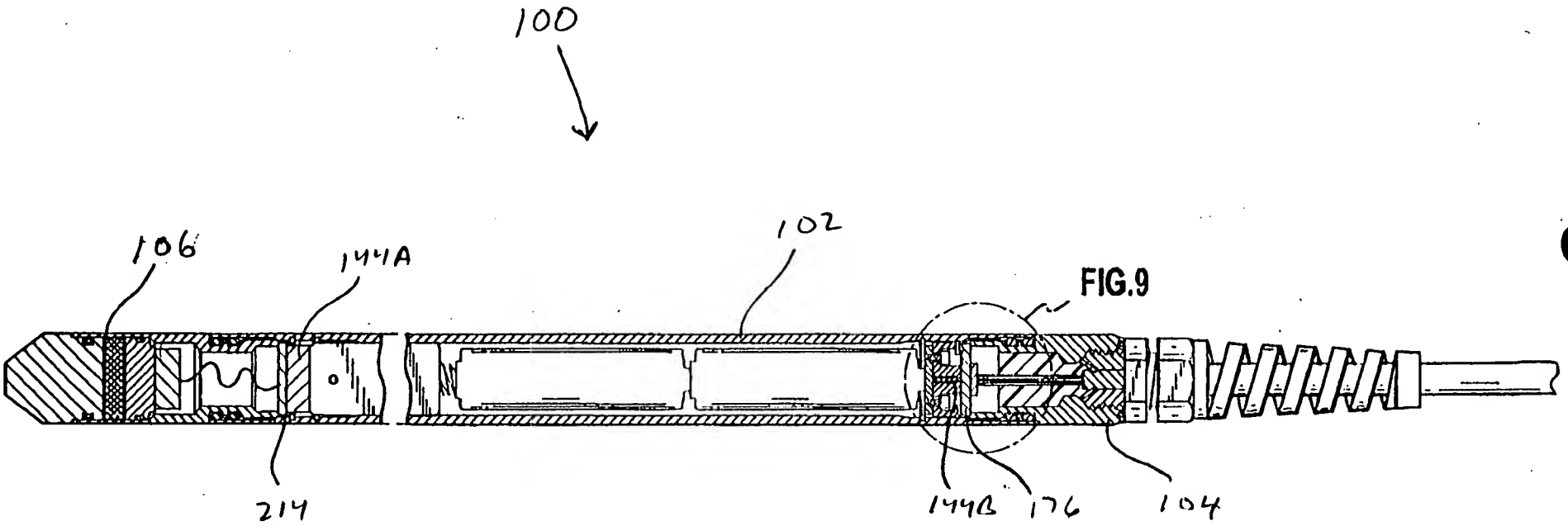


FIG.6

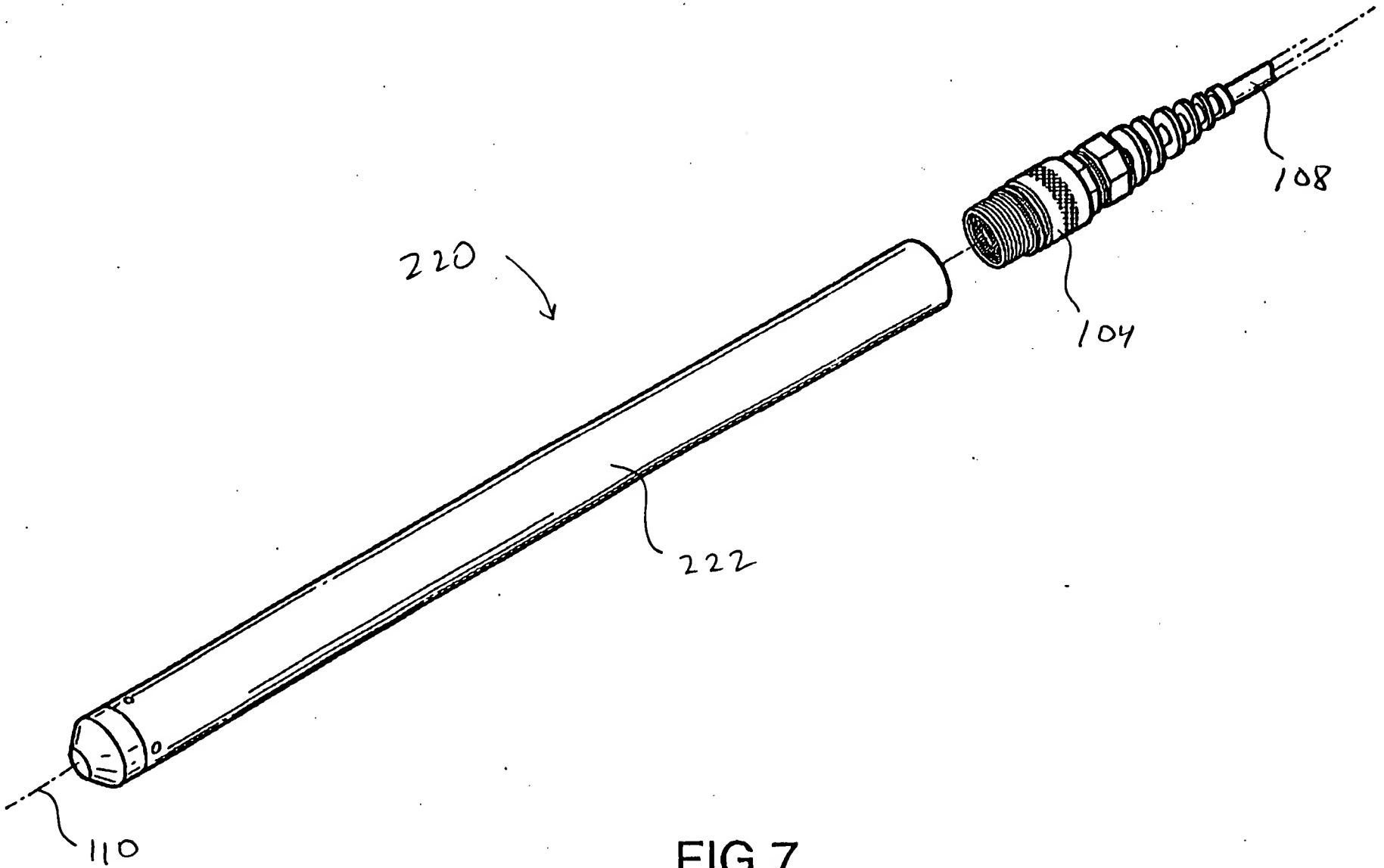


FIG.7

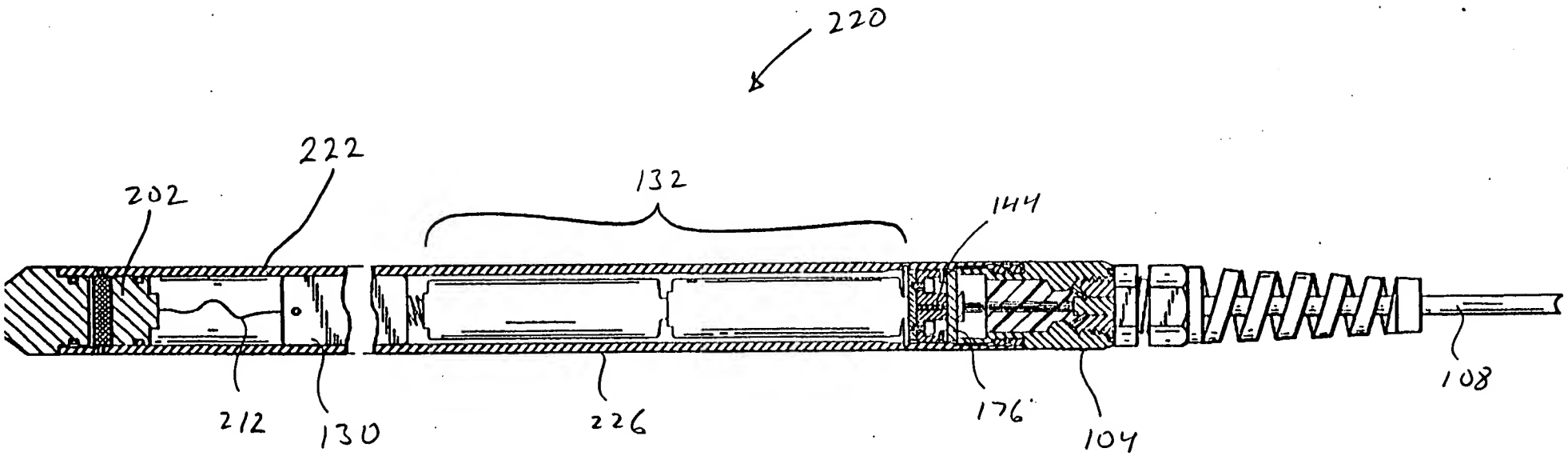


FIG.8

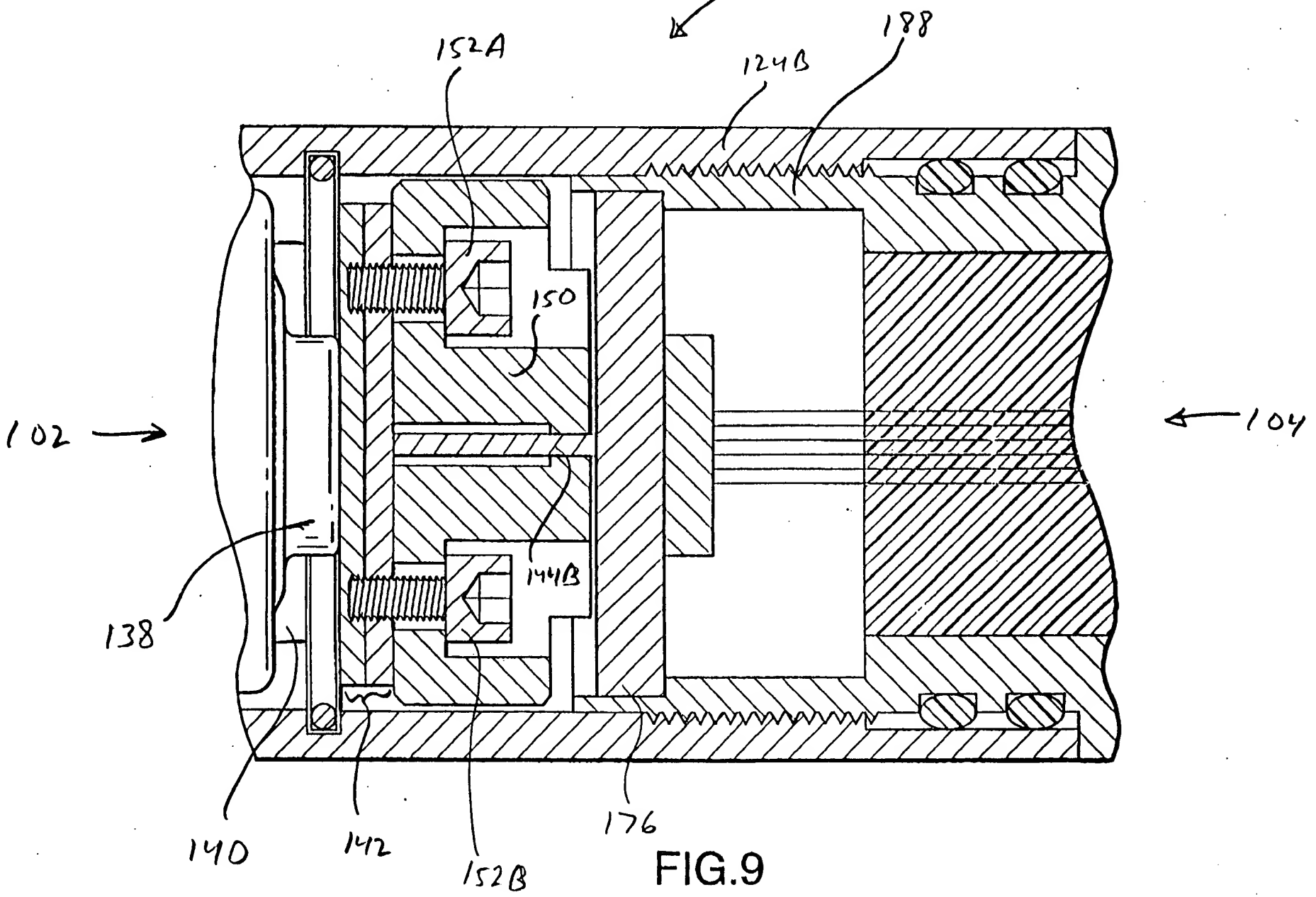


FIG.9

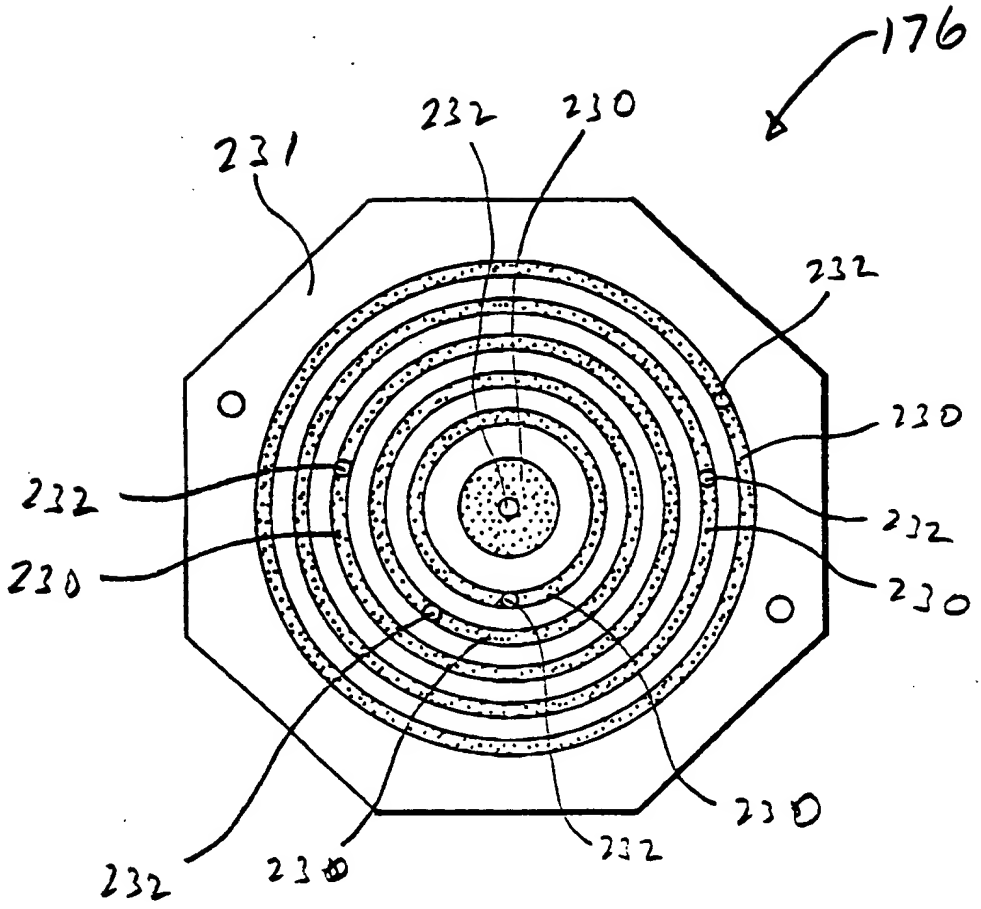


FIG. 10

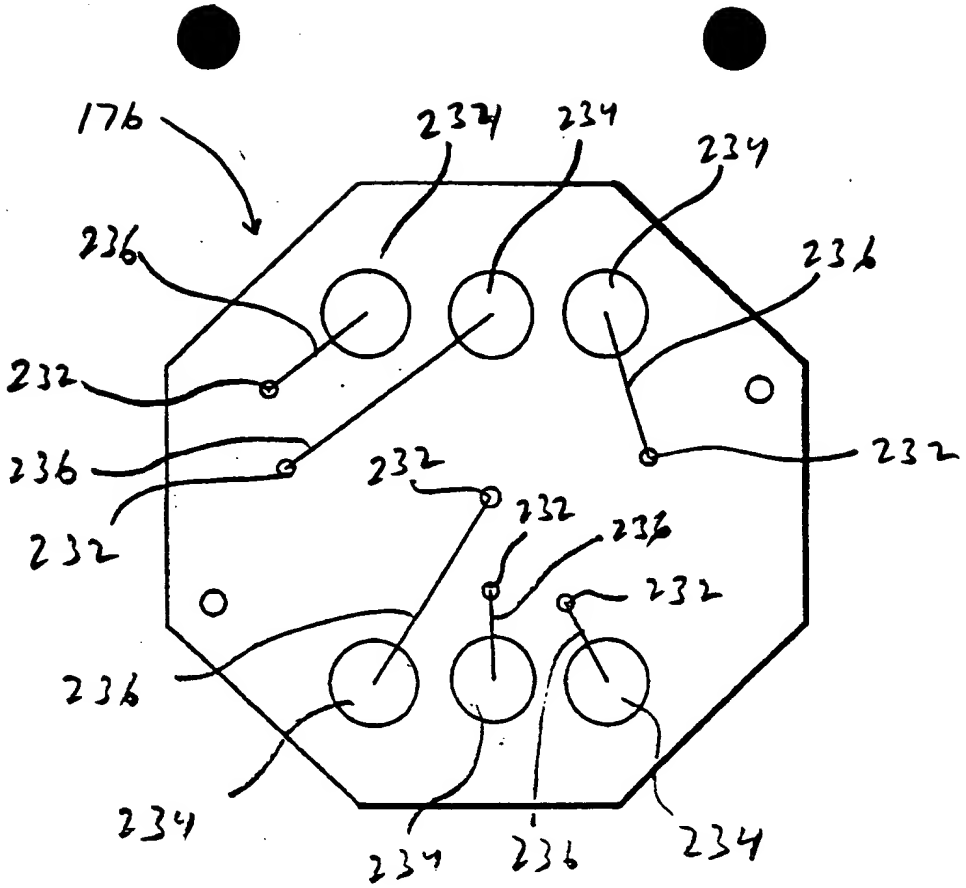

176
234
234
234
236
236
232
232
236
232
232
232
232
236
232
236
234
234
234
236
234

FIG. 11

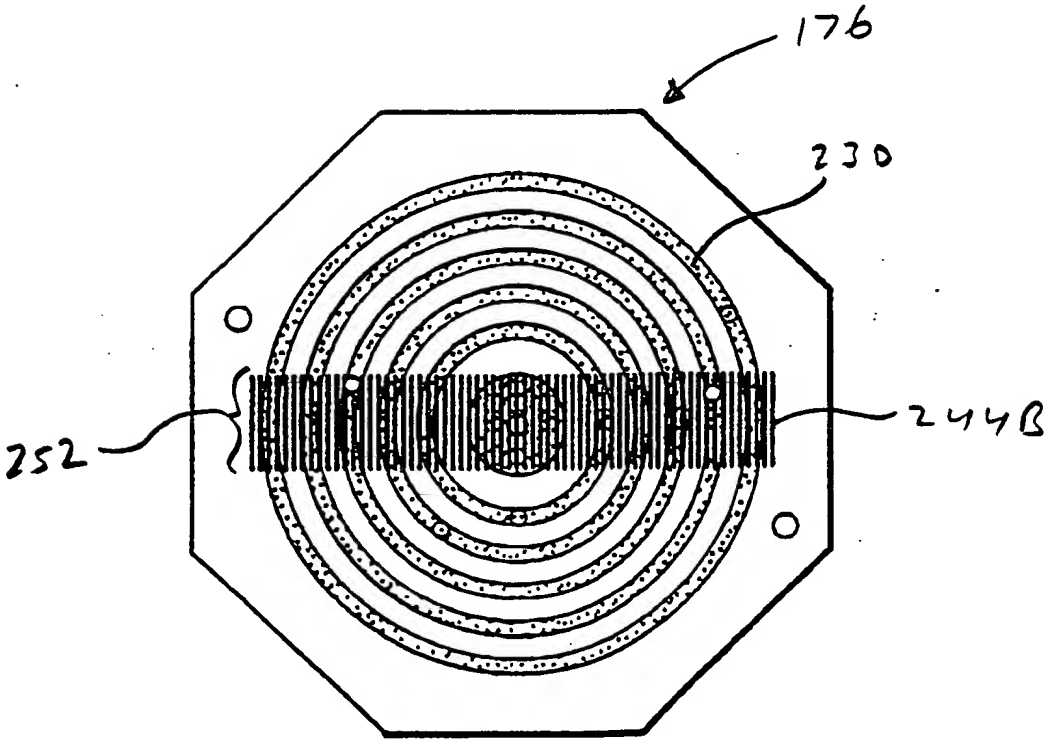

176
230
252
244B

FIG.14

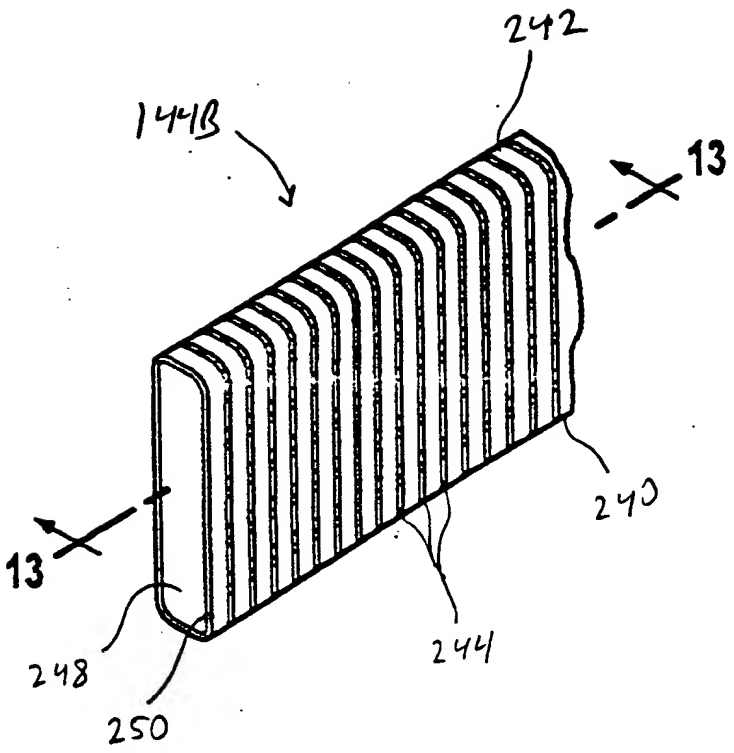


FIG.12

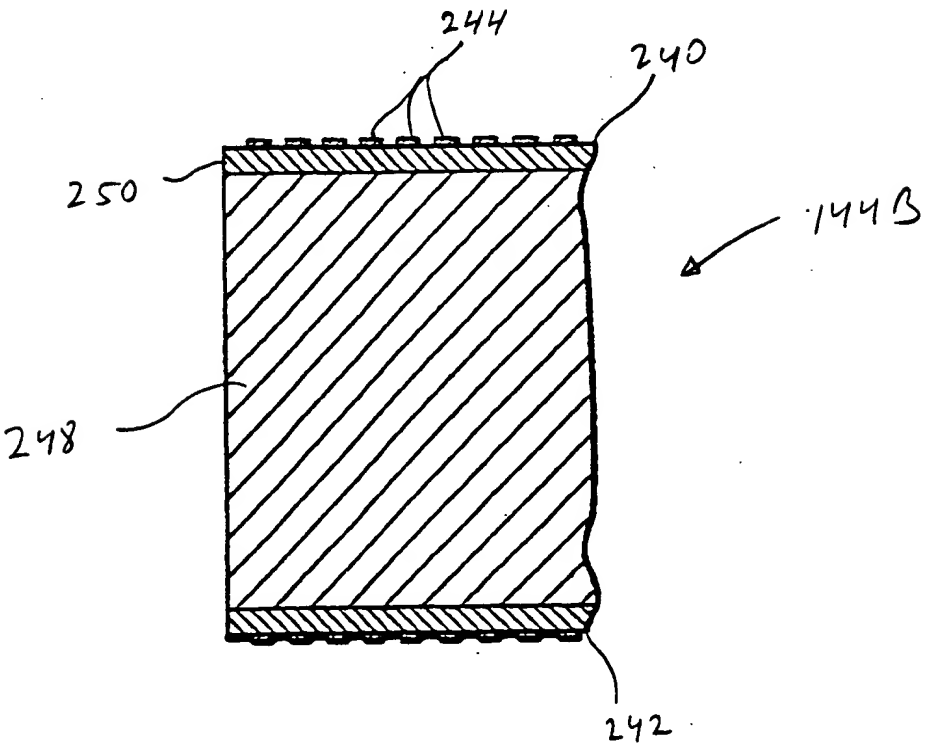


FIG.13

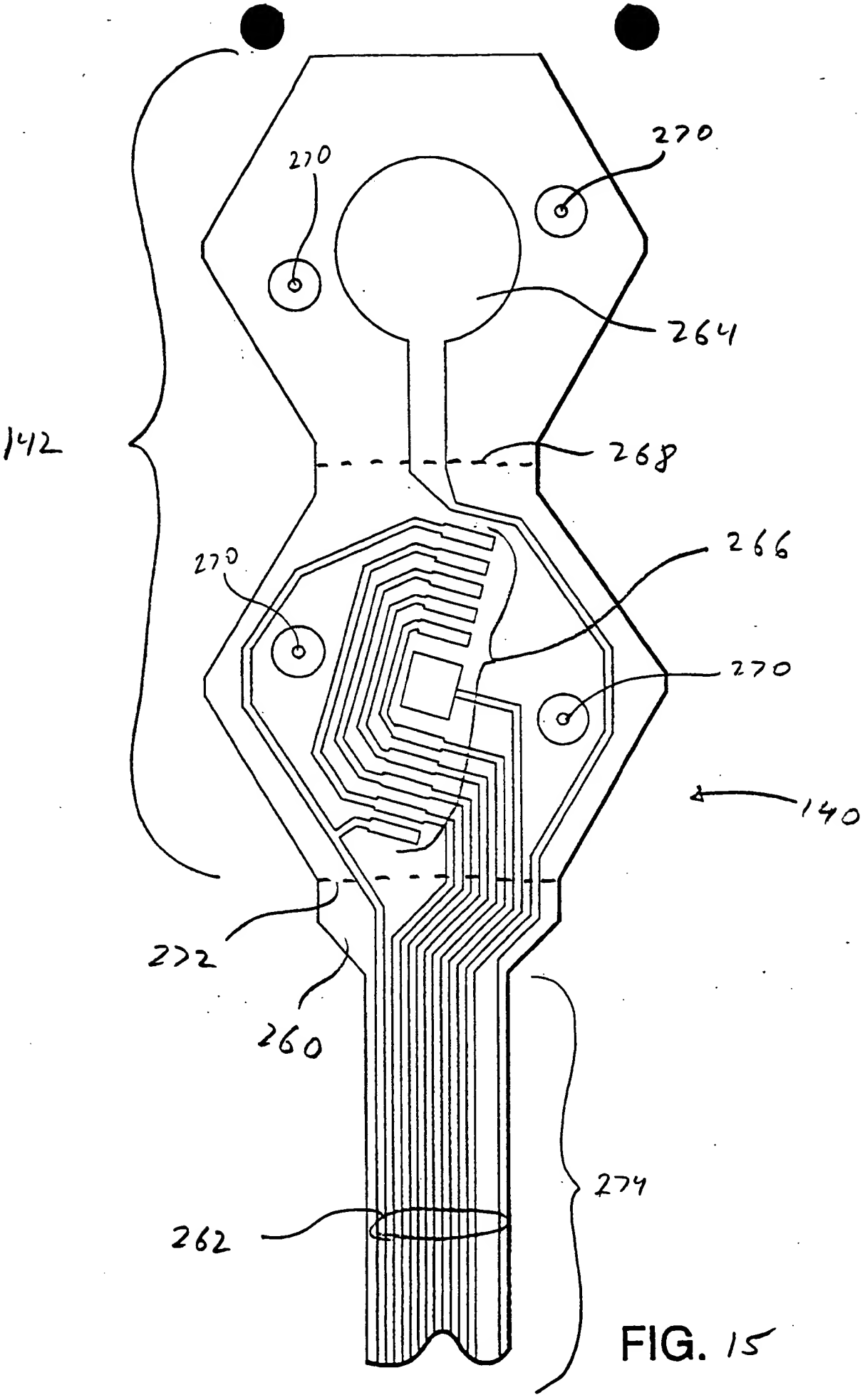


FIG. 15

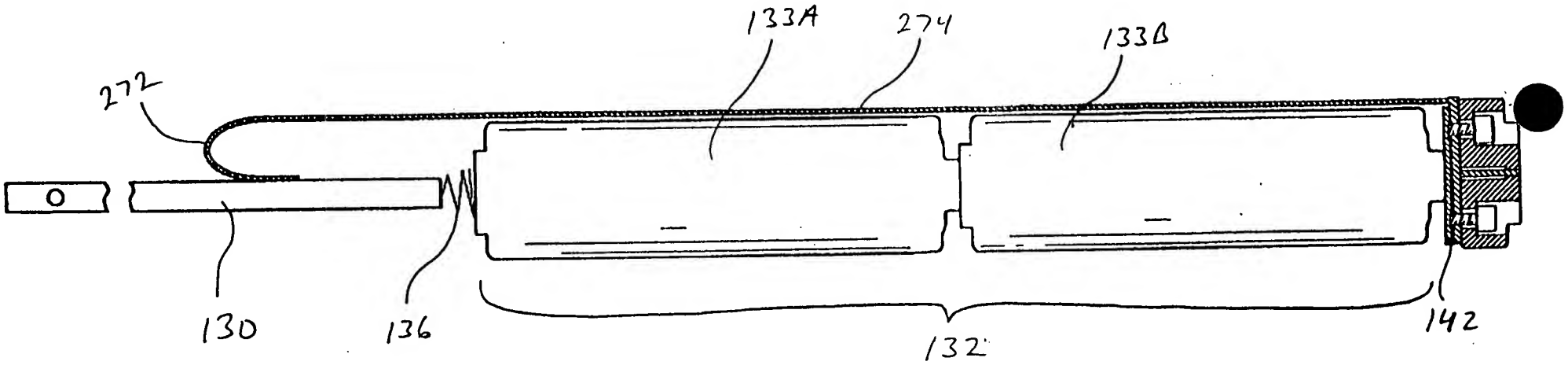


FIG.16

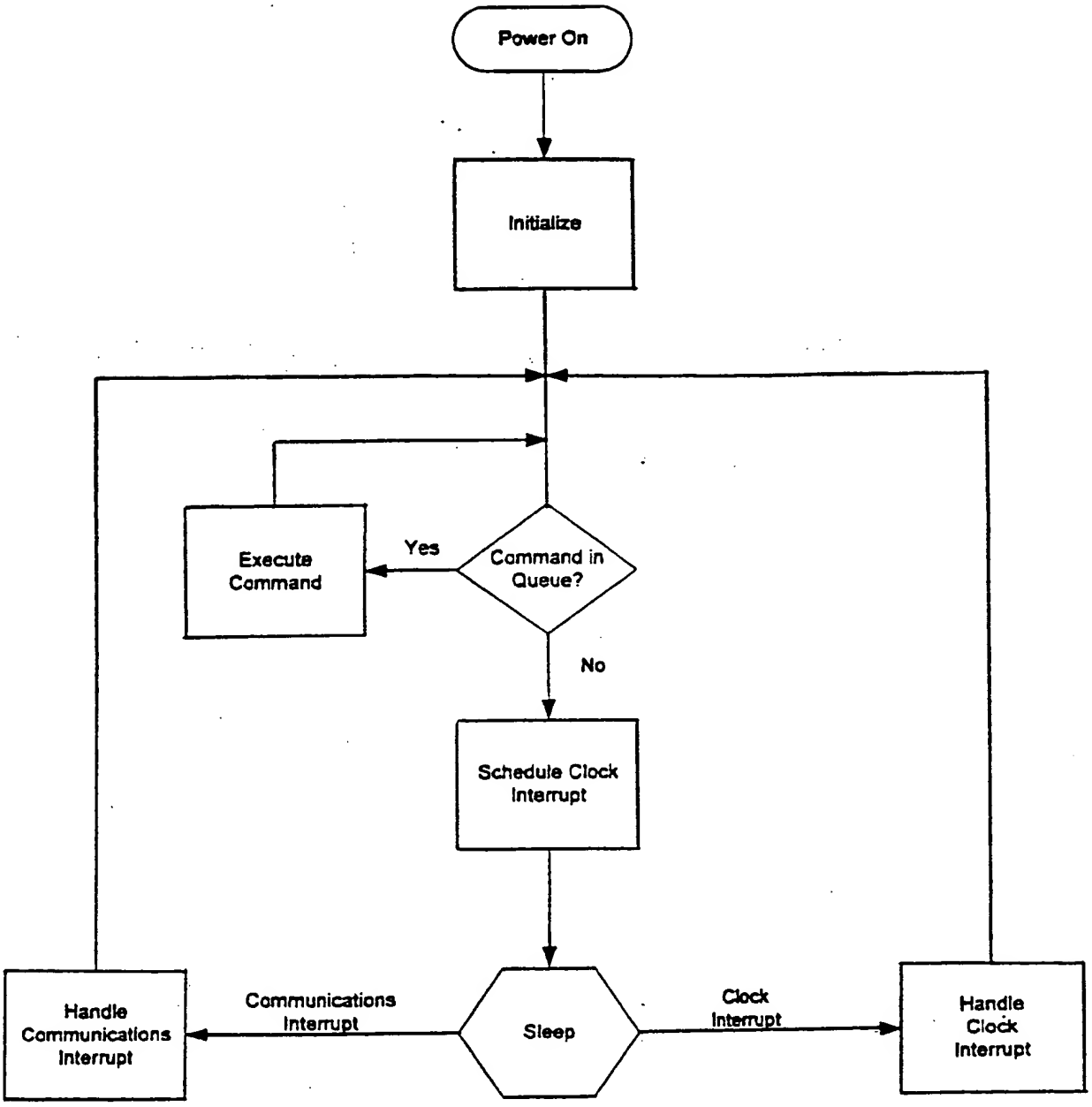

Power On
Initialize
Execute Command
Yes
Command in Queue?
No
Schedule Clock Interrupt
Handle Communications Interrupt
Communications Interrupt
Sleep
Clock Interrupt
Handle Clock Interrupt

FIG. 17

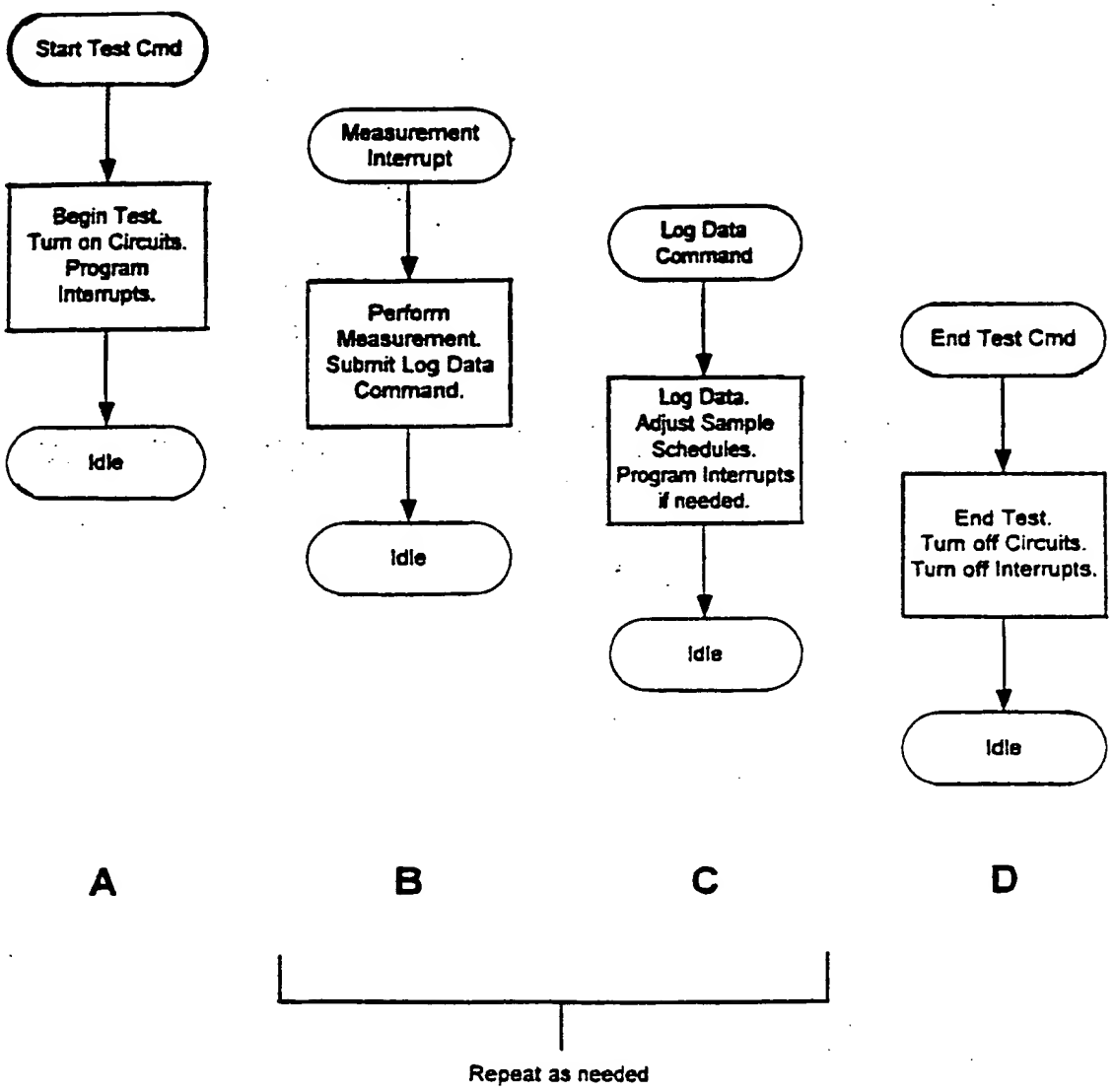

Start Test Cmd
Begin Test.
Turn on Circuits.
Program
Interrupts.
Idle
Measurement
Interrupt
Perform
Measurement.
Submit Log Data
Command.
Idle
Log Data
Command
Log Data.
Adjust Sample
Schedules.
Program Interrupts
if needed.
Idle
End Test Cmd
End Test.
Turn off Circuits.
Turn off Interrupts.
Idle
A
B
C
D
Repeat as needed

FIG. 18

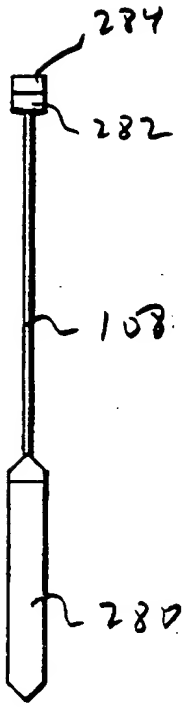


FIG.19

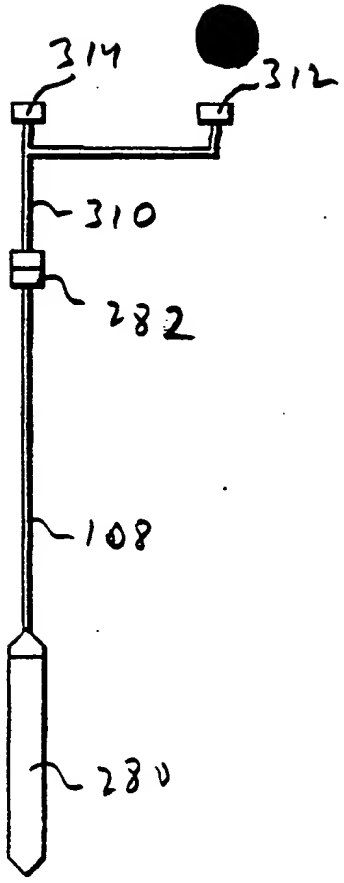


FIG. 24

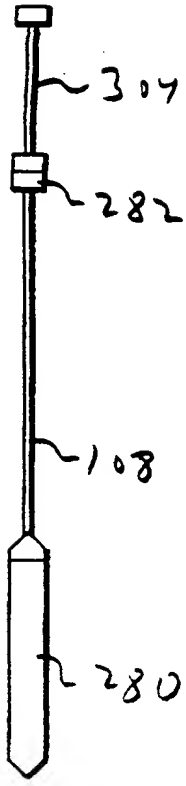


FIG. 23

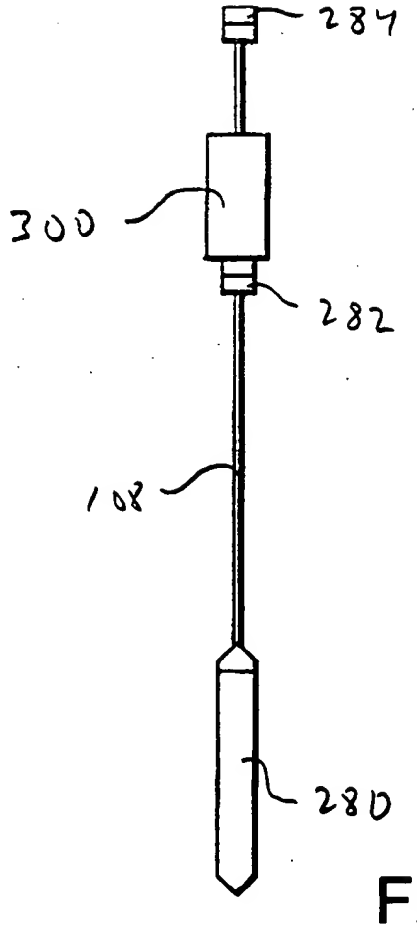


FIG.22

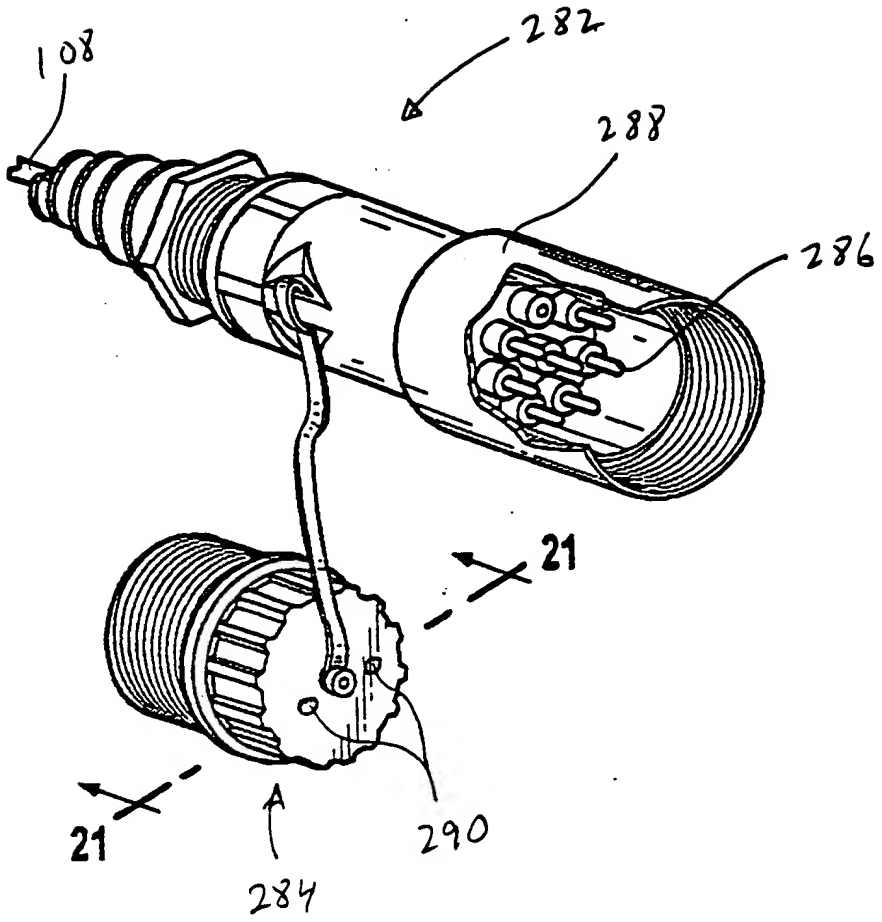


FIG.20

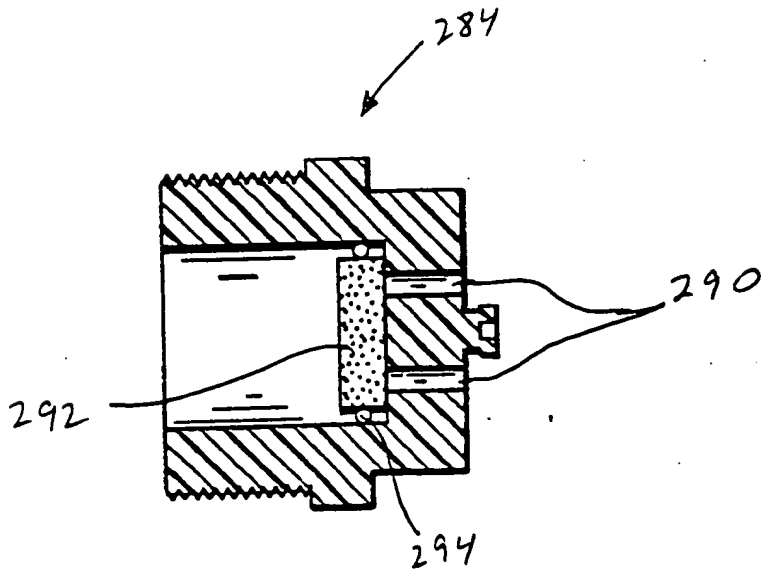


FIG.21

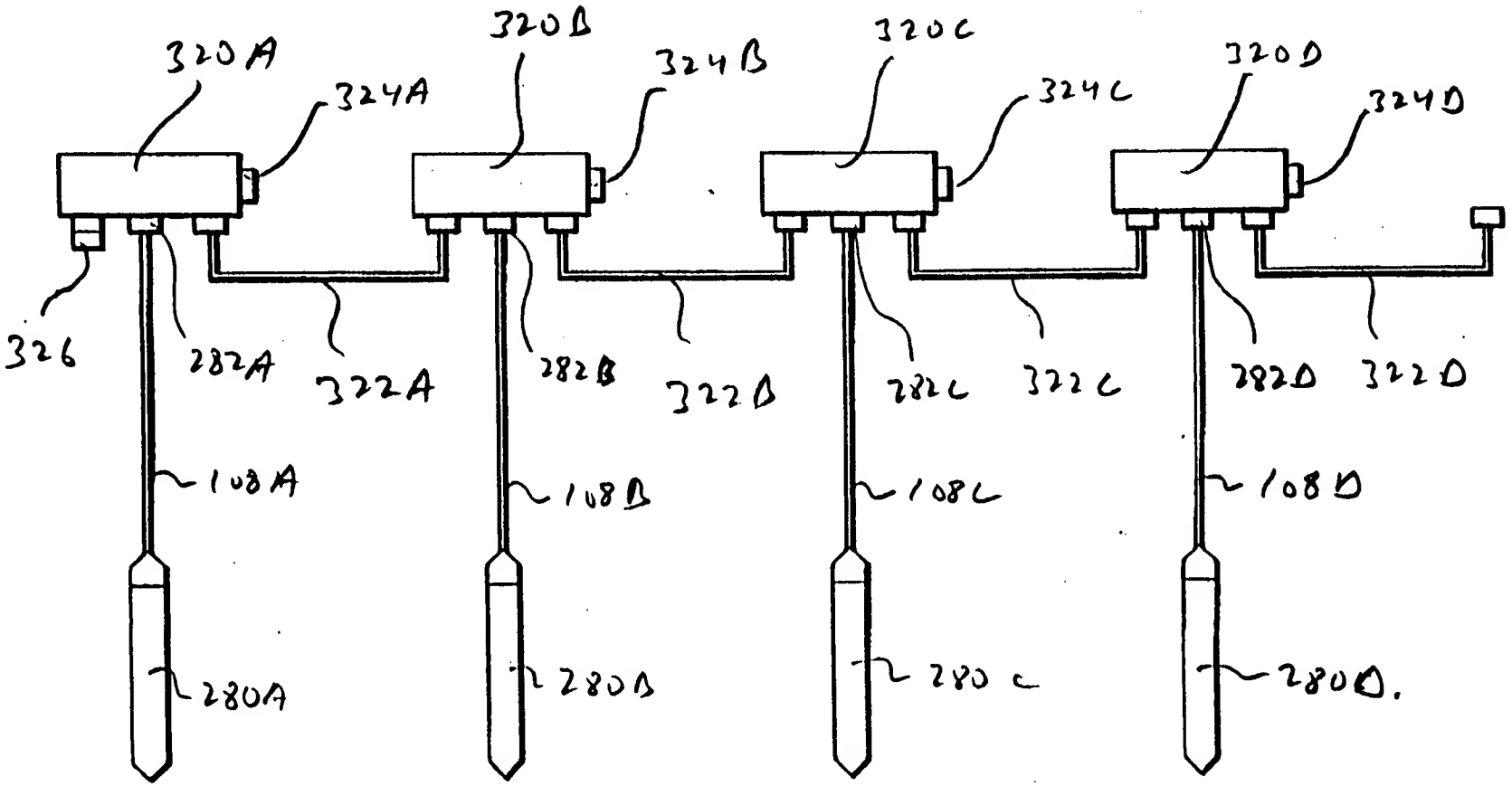

320A
324A
320B
324B
320C
324C
320D
324D
326
282A
322A
282B
322B
282C
322C
282D
322D
108A
108B
108C
108D
280A
280B
280C
280D.

FIG. 25

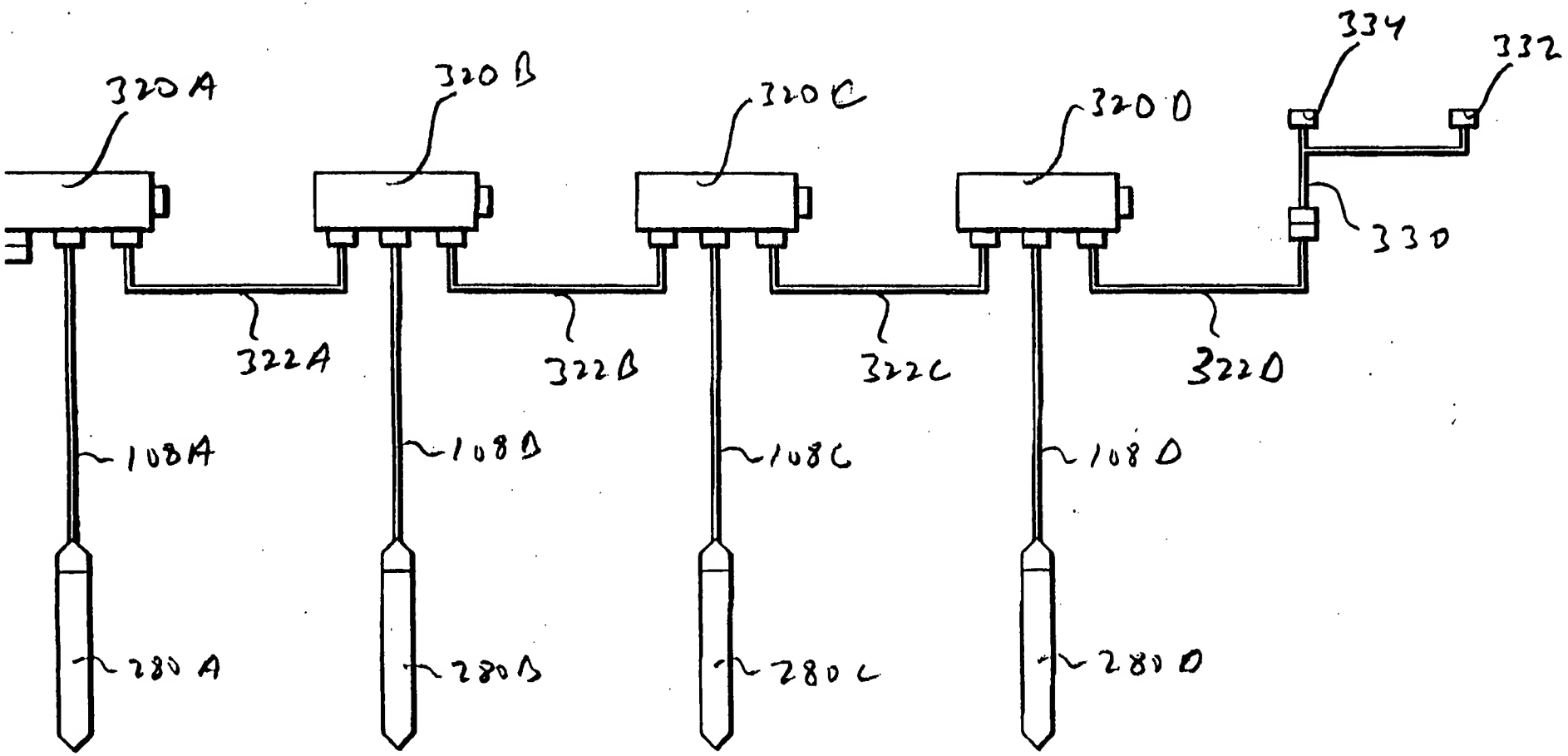


FIG. 26

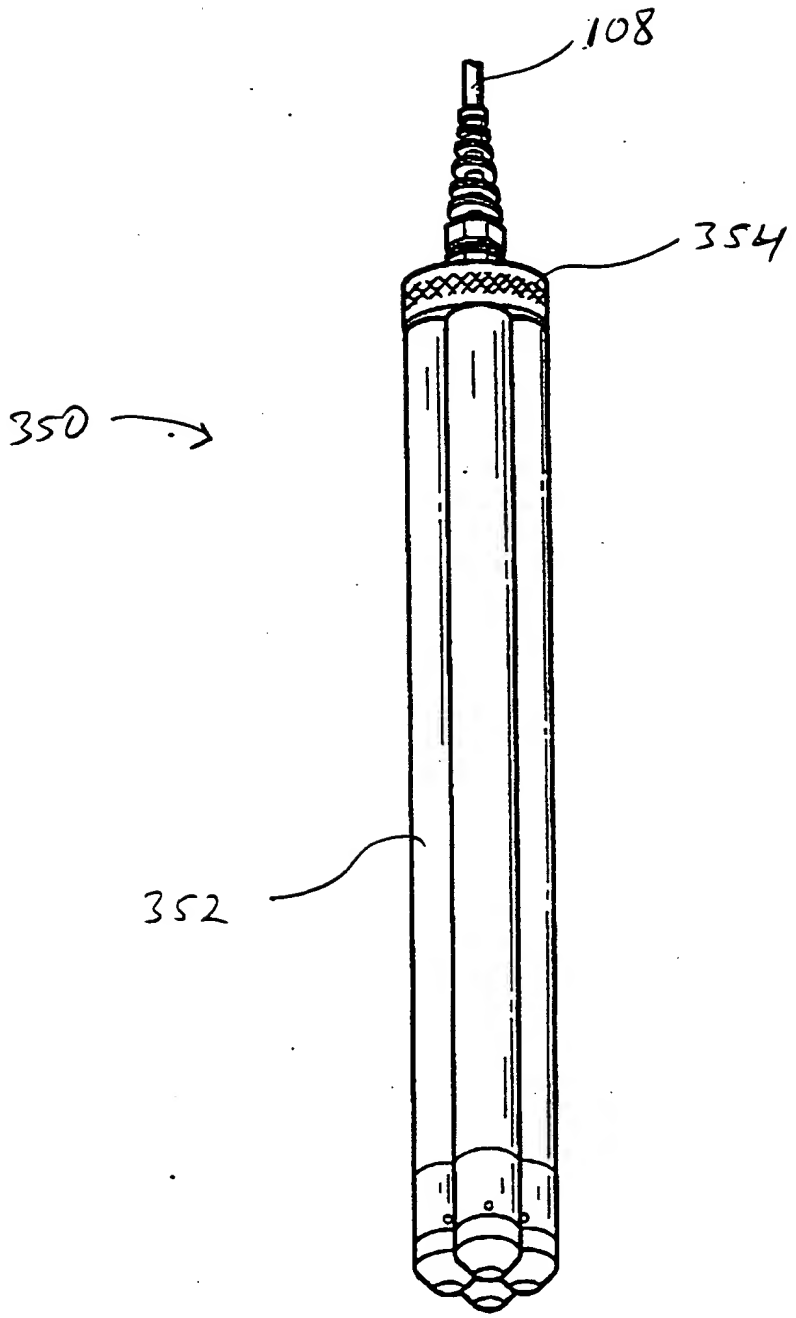
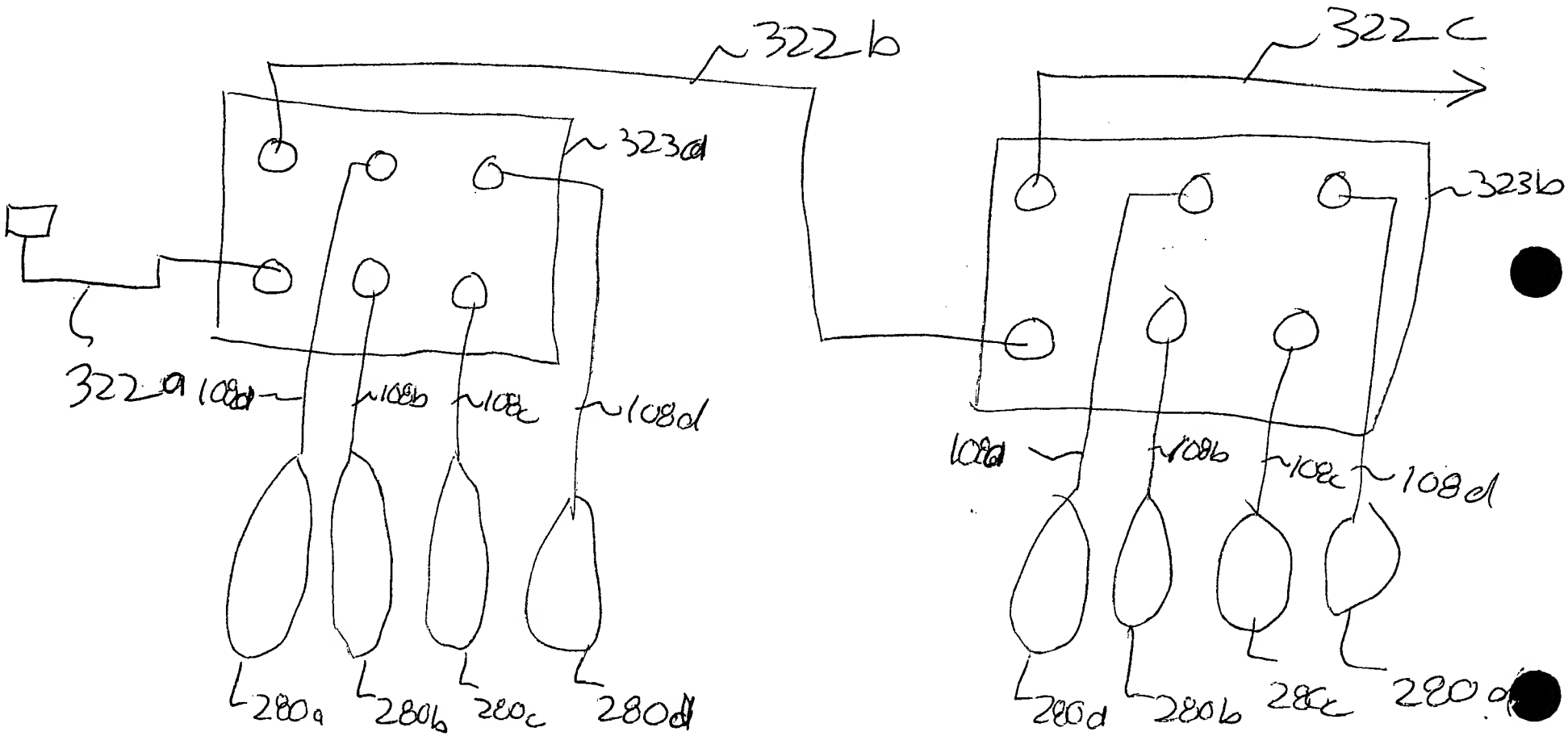


FIG.27



F16.28

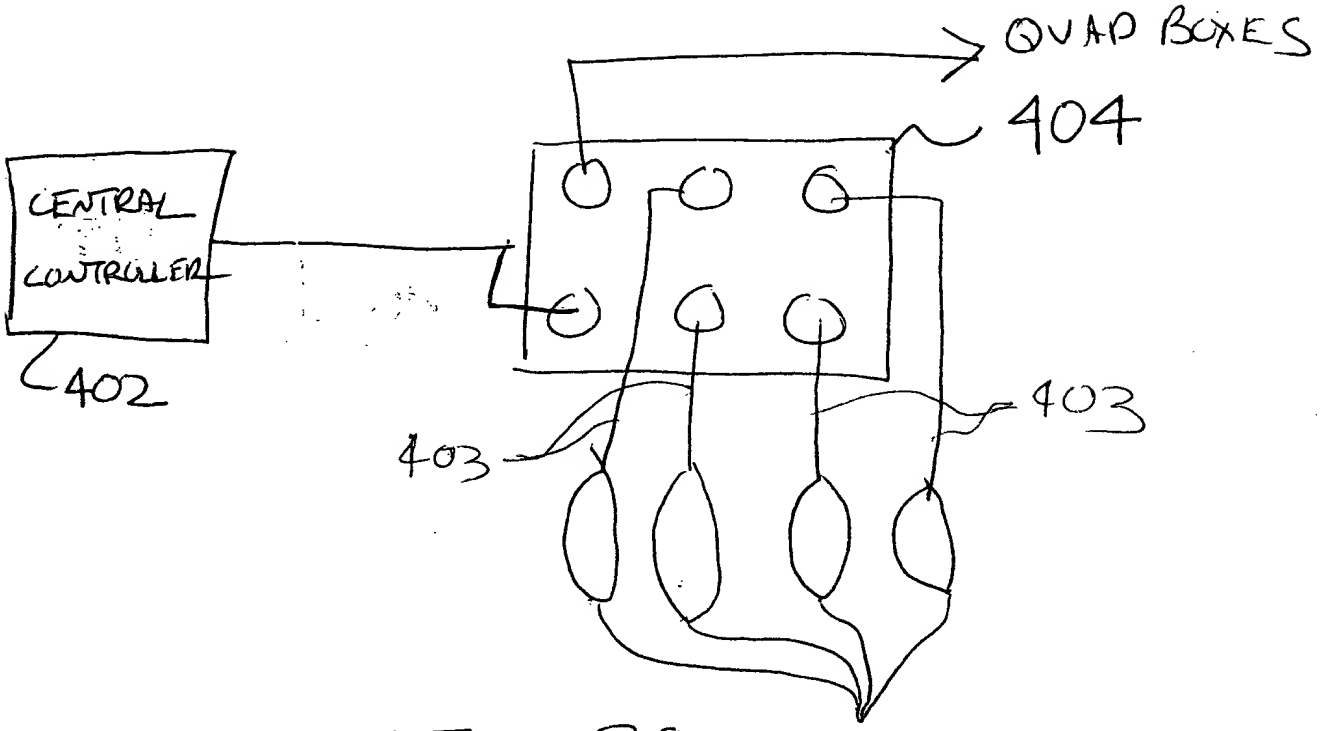


FIG. 29a

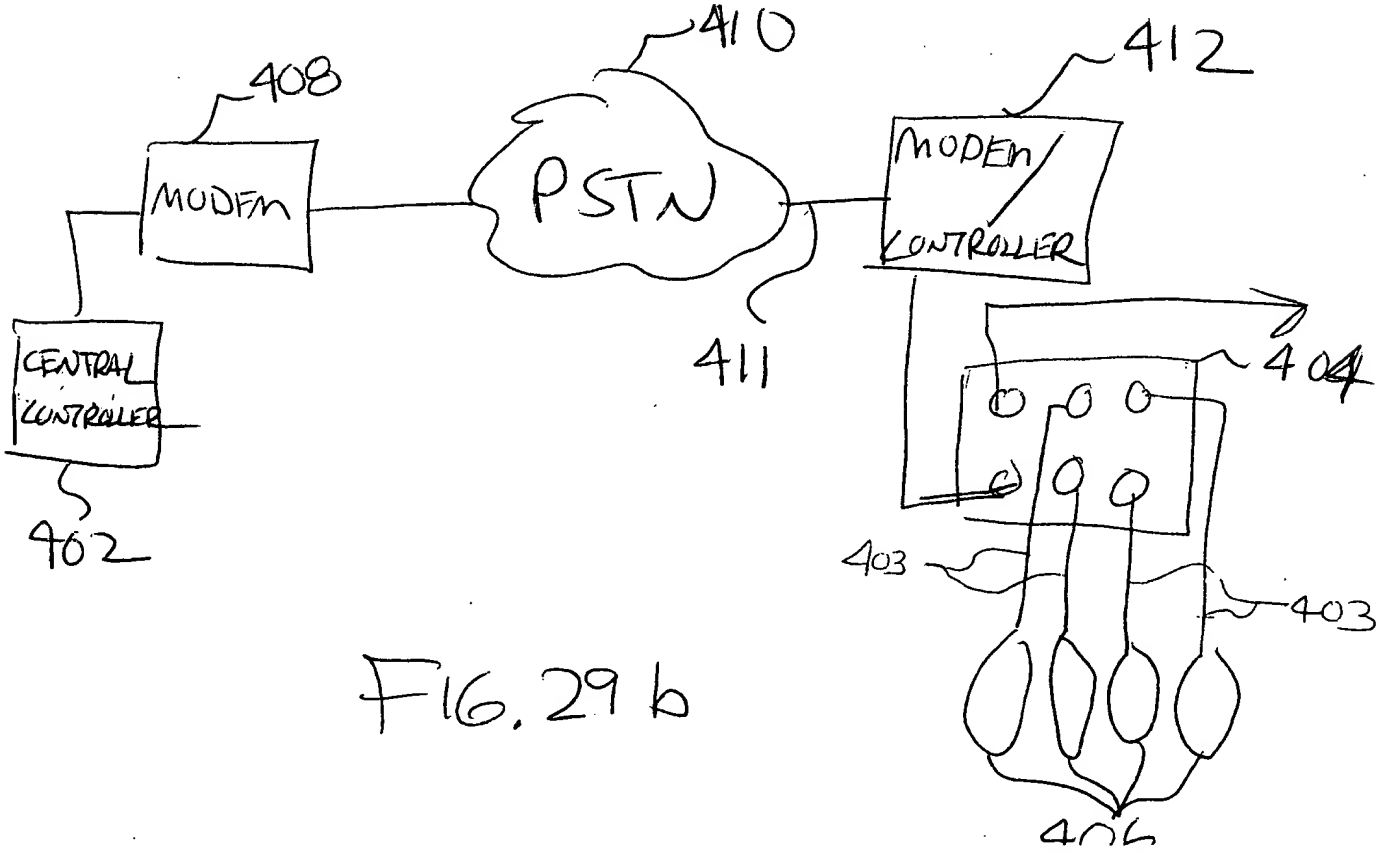


FIG. 29b

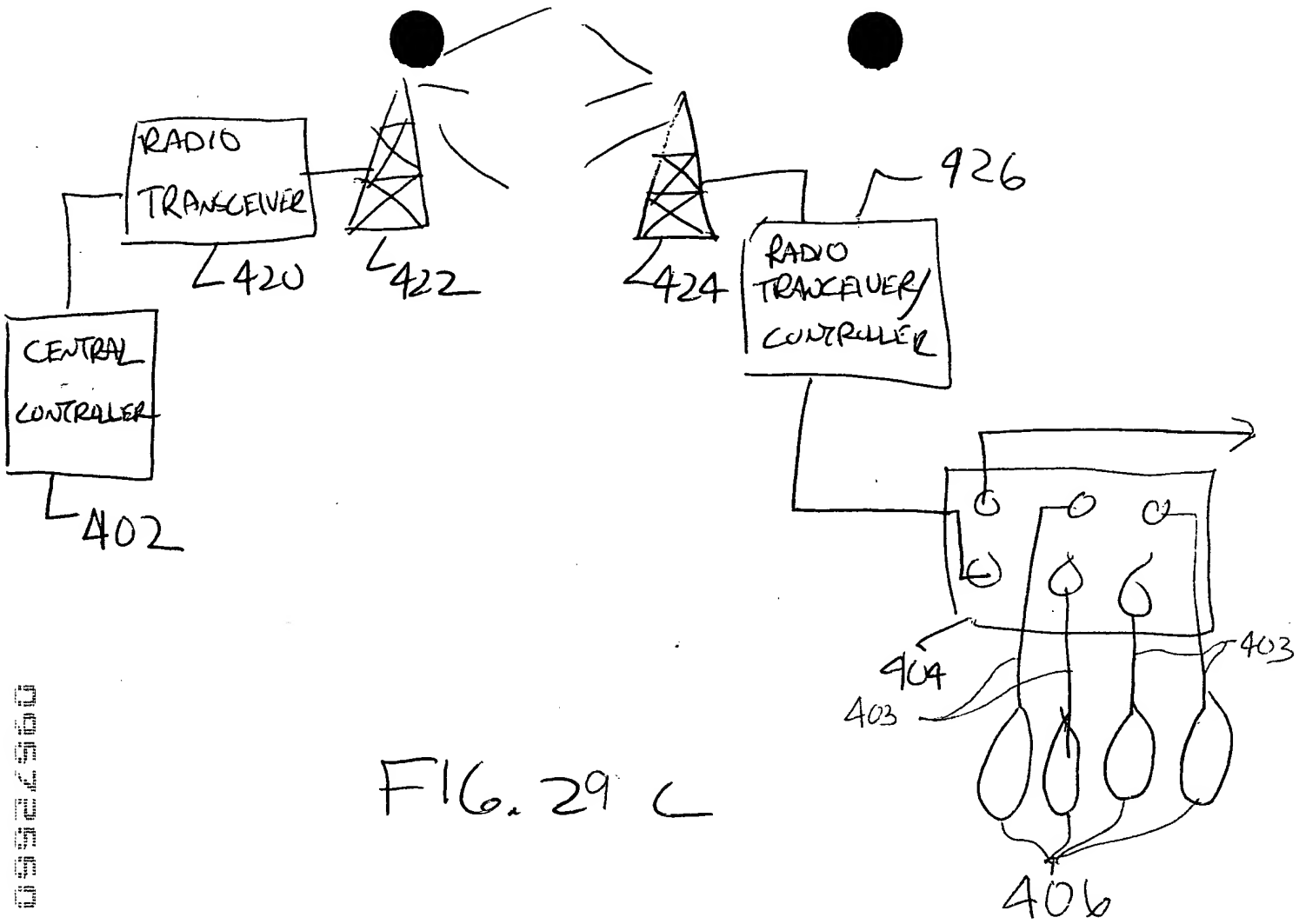


FIG. 29c

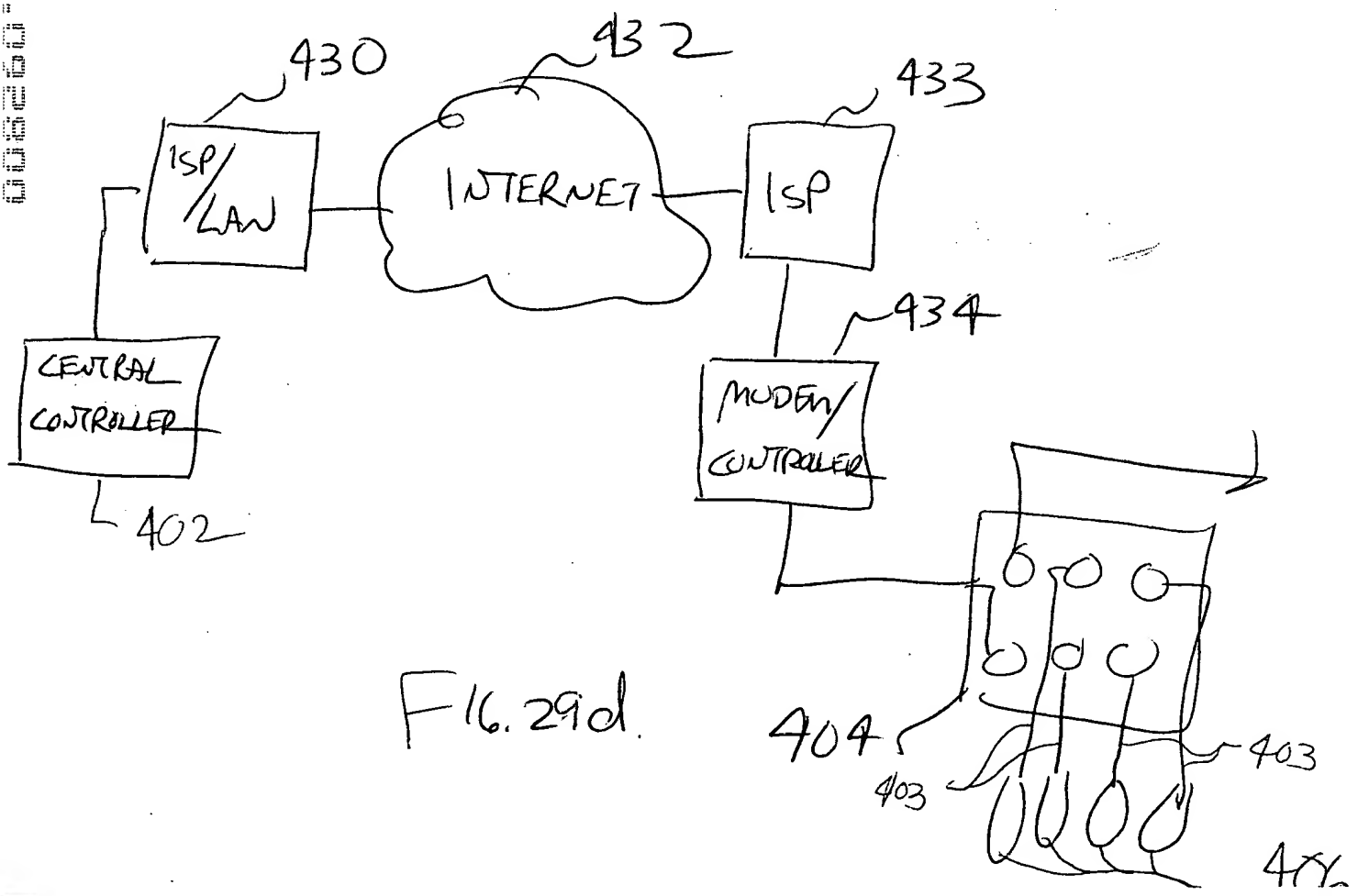


FIG. 29d

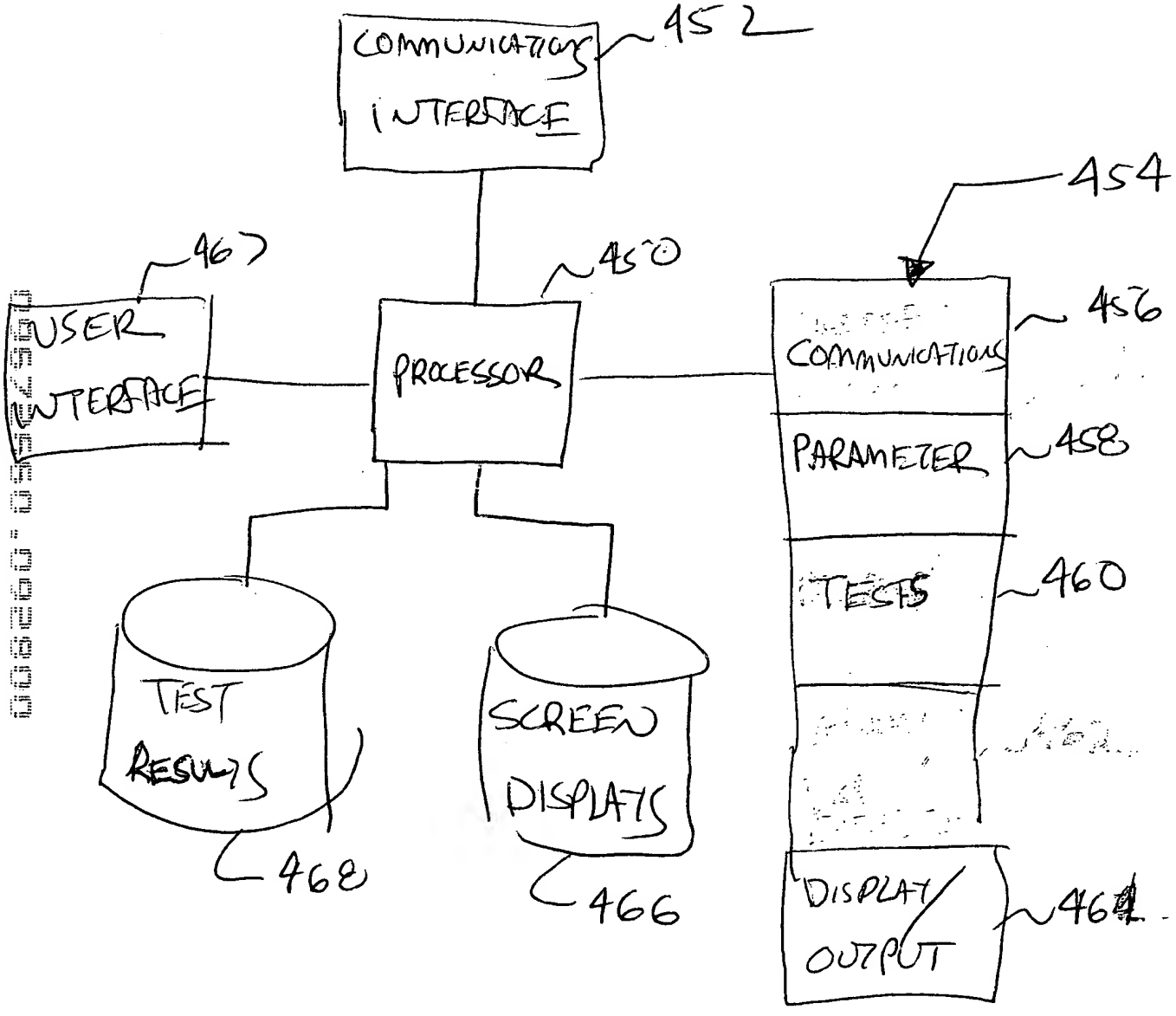

COMMUNICATIONS INTERFACE
452
454
467
USER INTERFACE
PROCESSOR
450
COMMUNICATIONS
456
PARAMETER
458
TESTS
460
TEST RESULTS
SCREEN DISPLAYS
DISPLAY OUTPUT
468
466
464
402

FIG 30

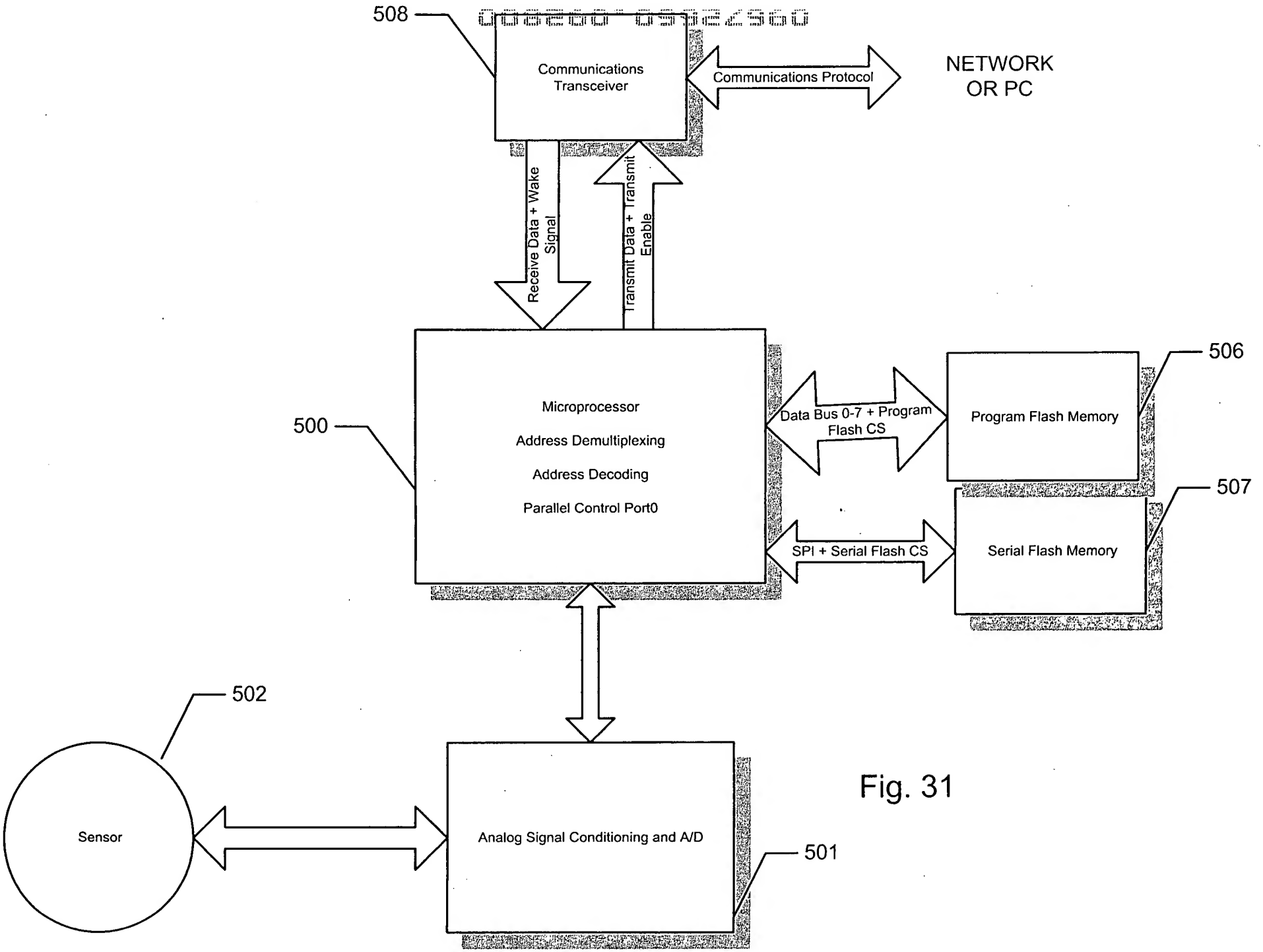

508
Communications Transceiver
Communications Protocol
NETWORK OR PC
Receive Data + Wake Signal
Transmit Data + Transmit Enable
Microprocessor
Address Demultiplexing
Address Decoding
Parallel Control Port0
500
Data Bus 0-7 + Program Flash CS
Program Flash Memory
506
SPI + Serial Flash CS
Serial Flash Memory
507
502
Sensor
Analog Signal Conditioning and A/D
501

Fig. 31

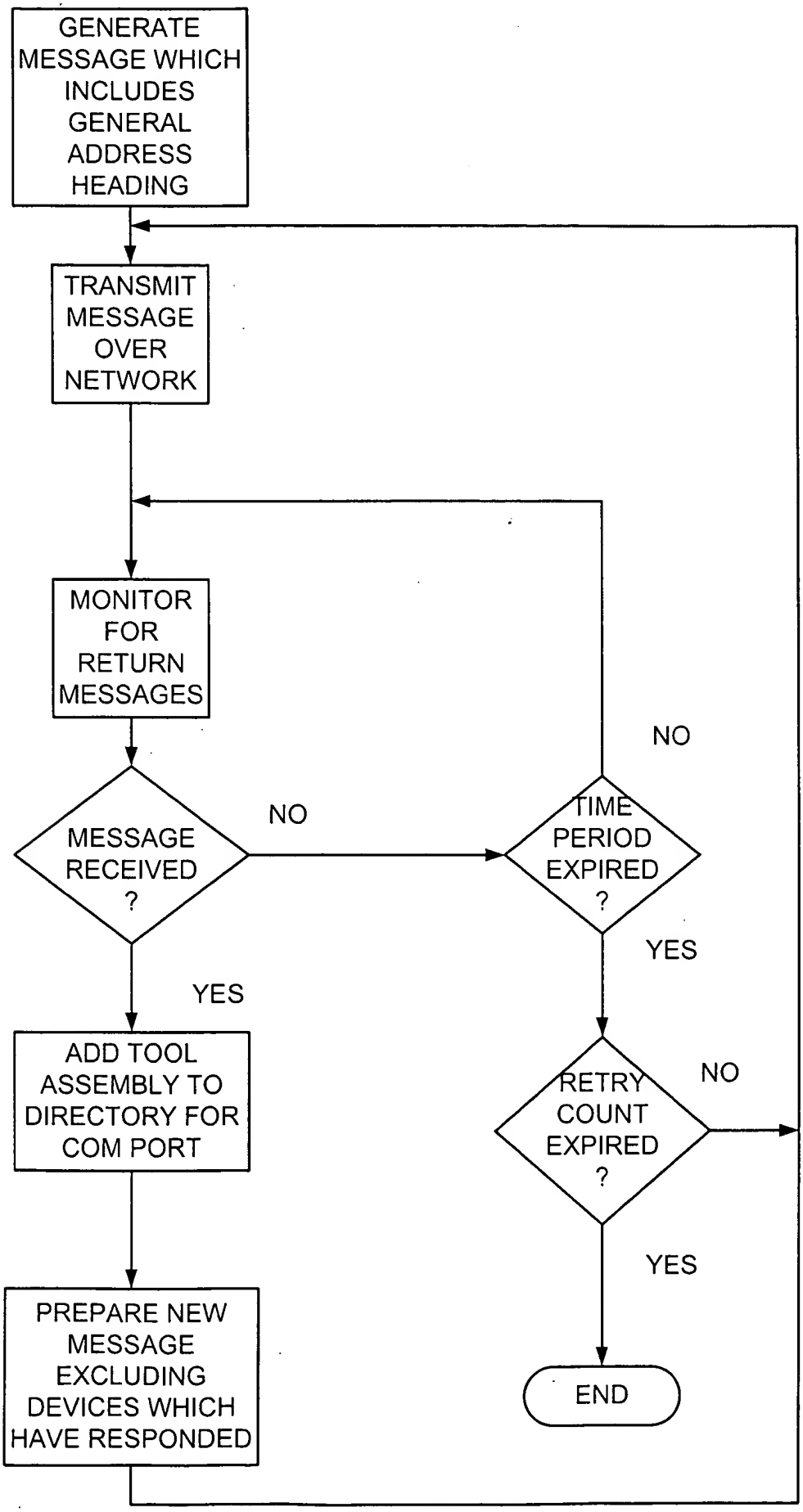

GENERATE MESSAGE WHICH INCLUDES GENERAL ADDRESS HEADING
TRANSMIT MESSAGE OVER NETWORK
MONITOR FOR RETURN MESSAGES
MESSAGE RECEIVED ?
NO
TIME PERIOD EXPIRED ?
NO
YES
YES
ADD TOOL ASSEMBLY TO DIRECTORY FOR COM PORT
RETRY COUNT EXPIRED ?
NO
YES
PREPARE NEW MESSAGE EXCLUDING DEVICES WHICH HAVE RESPONDED
END

FIG. 32

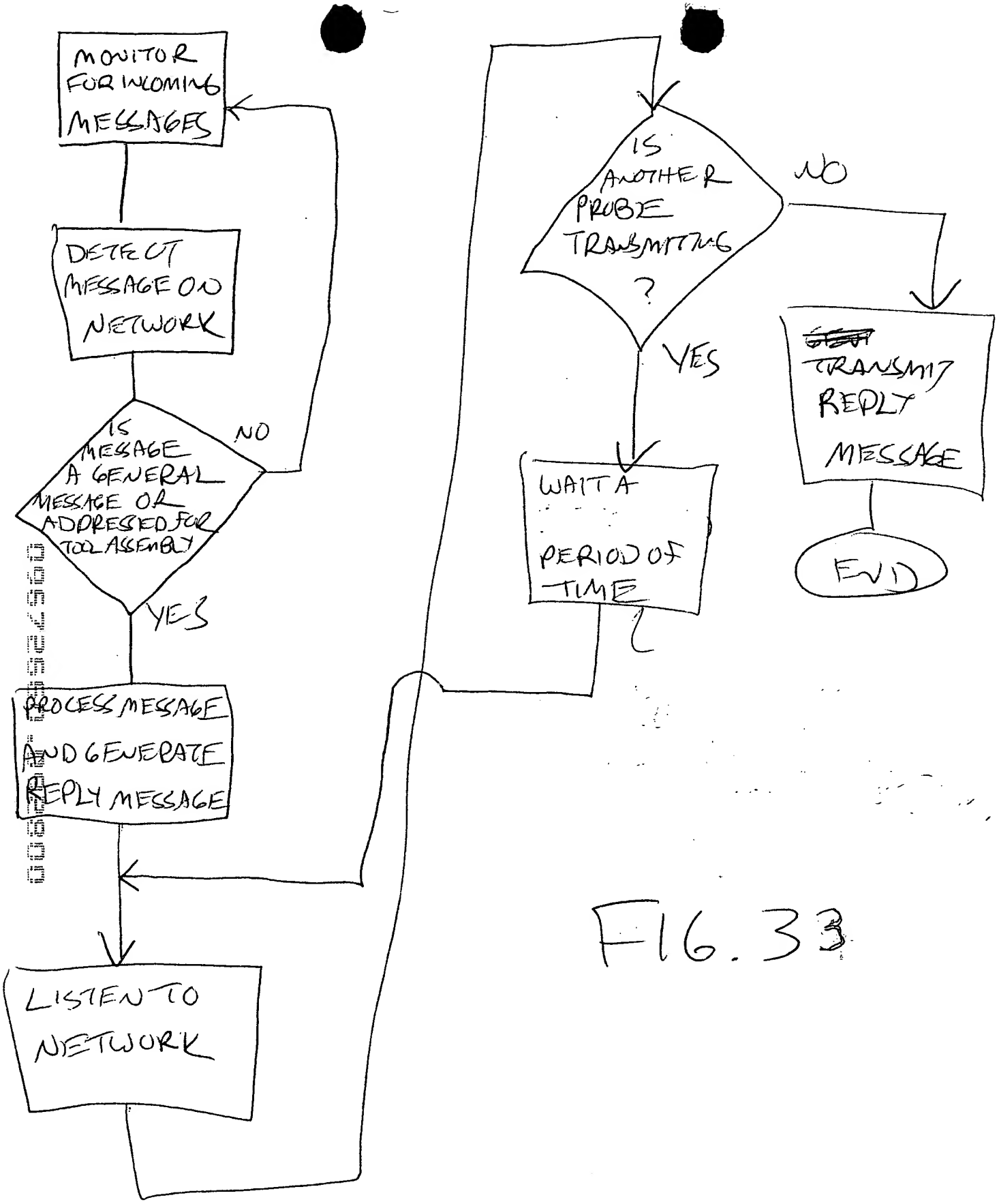

MONITOR FOR INCOMING MESSAGES
DETECT MESSAGE ON NETWORK
IS MESSAGE A GENERAL MESSAGE OR ADDRESSED FOR TOOL ASSEMBLY
NO
YES
PROCESS MESSAGE AND GENERATE REPLY MESSAGE
LISTEN TO NETWORK
IS ANOTHER PROBE TRANSMITTING ?
NO
YES
WAIT A PERIOD OF TIME
TRANSMIT REPLY MESSAGE
END

FIG. 33

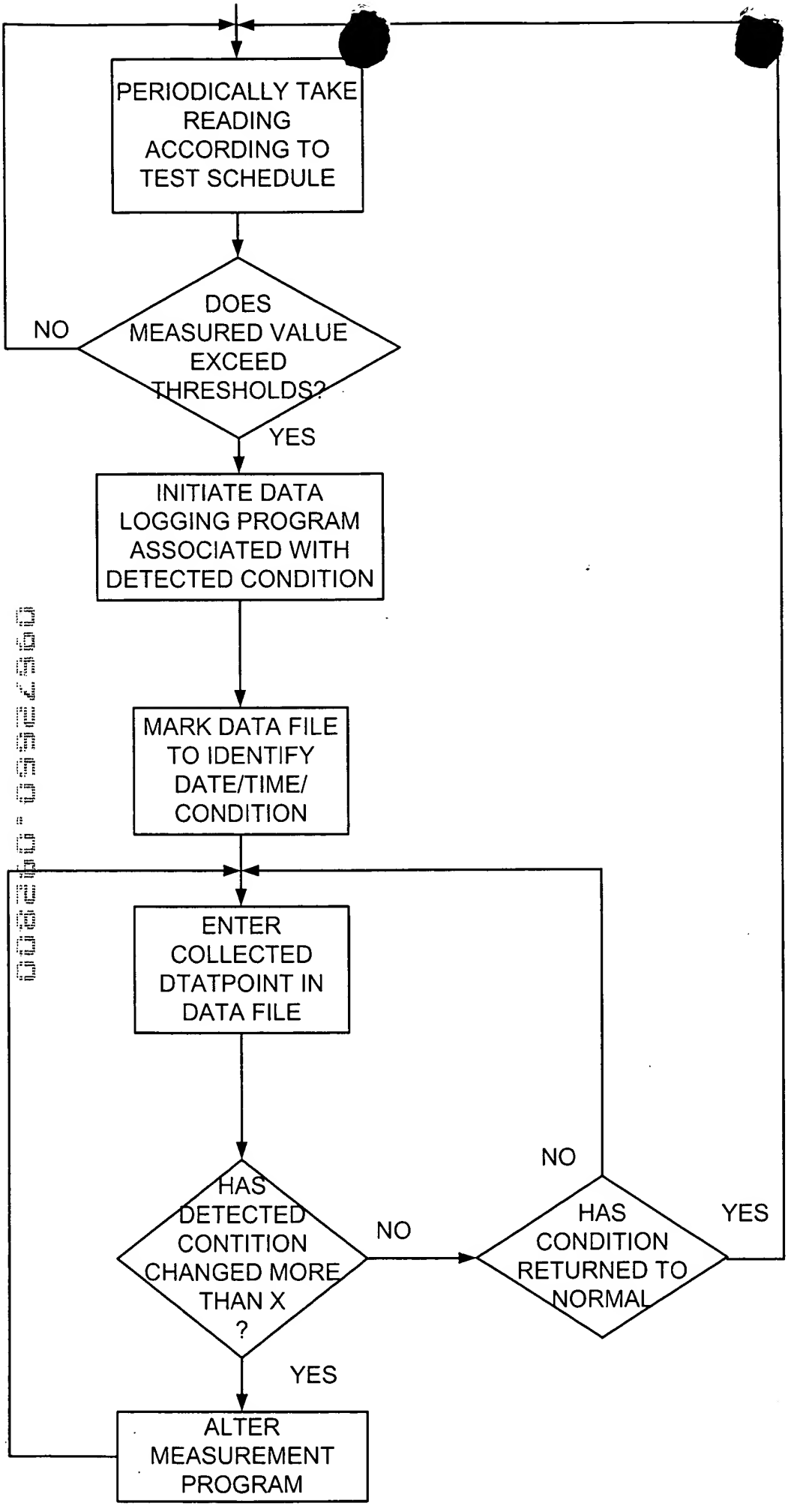
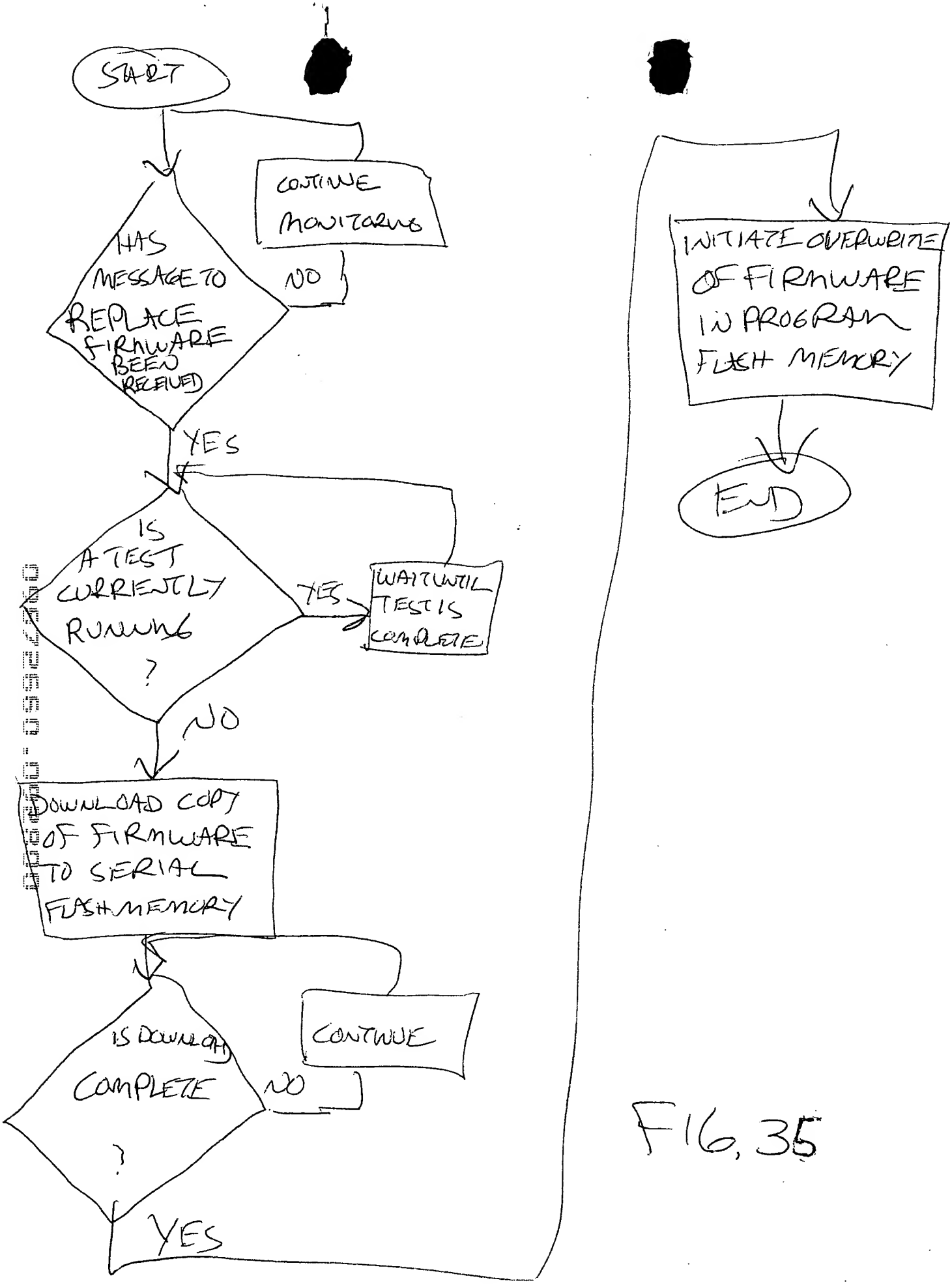

PERIODICALLY TAKE READING ACCORDING TO TEST SCHEDULE
DOES MEASURED VALUE EXCEED THRESHOLDS?
NO
YES
INITIATE DATA LOGGING PROGRAM ASSOCIATED WITH DETECTED CONDITION
MARK DATA FILE TO IDENTIFY DATE/TIME/ CONDITION
ENTER COLLECTED DTATPOINT IN DATA FILE
HAS DETECTED CONTITION CHANGED MORE THAN X ?
NO
YES
HAS CONDITION RETURNED TO NORMAL
NO
YES
ALTER MEASUREMENT PROGRAM

FIG. 34


START
CONTINE MONITORING
HAS MESSAGE TO REPLACE FIRMWARE BEEN RECEIVED
NO
YES
IS A TEST CURRENTLY RUNNING ?
YES
WAIT UNTIL TEST IS COMPLETE
NO
DOWNLOAD COPY OF FIRMWARE TO SERIAL FLASH MEMORY
IS DOWNLOAD COMPLETE ?
CONTINUE
NO
YES
INITIATE OVERWRITE OF FIRMWARE IN PROGRAM FLASH MEMORY
END

F16, 35